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RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS.

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THIRTY-SEVENTH YEAR.

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RAILROAD GAZETTE

FRIDAY, JAN. 6, 1893.

CONTENTS.

ILLUSTRATIONS:	PAGE.
Pacific Extension of the Great Northern	2
McMahon's Ammonia railroad Motor	3
Hawley Down-Draft Furnace	4
American Car Coupler—M. C. B. Standard	5
Tank Car with Steel Underframe	6
Multiple Horizontal Car Borer	7
Standard Trestle—Southern Pacific—Atlantic System	8
CONTRIBUTIONS:	
Air Brakes on Freight Trains	1
The Structure of the Quaker City Elevated Railroad	1
EDITORIALS:	
Rapid Transit in New York	10
The Value of Steam Jackets on Locomotives	11
European and American Car Service	11
EDITORIAL NOTES	10, 11
NEW PUBLICATIONS	12
TRADE CATALOGUES	13
GENERAL NEWS:	
Locomotive Building	14
Car Building	14
Bridge Building	14
Railroad Law	14
Meetings and Announcements	15
Personal	16
Elections and Appointments	16
Railroad Construction	17
General Railroad News	17
Traffic	18
MISCELLANEOUS:	
Technical	9, 13
The Scrap Heap	13
British Canal and Railroad Competition	1
Shop Notes	3
The New Rates in England	5
Feed Waters and Boiler Incrustation	7
The Leland Low Pressure Steam Heating System	8
Annual Report of Kansas Railroad Commissioners	8
The Trade of Buffalo	9
An Englishman's Observations on American Signaling	9

Contributions.

Air Brakes on Freight Trains.

Interoceanic Railway of Mexico,
PUEBLA, Dec. 23, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article in your issue, Nov. 25, under the heading "The Use of Air Brakes on Freight Trains," I have read with interest, and yet I have wondered how we, in Mexico, are practically in advance of many lines in the States. We handle all our freight trains with air, but there was a time when only a portion of the cars were so equipped. We then piped the others and made up our train with air brake car next to engine, then two piped cars, then air brake car, etc., and we have never had an accident from using air in this manner. Possibly, if officers in the United States were to try this manner they would find it preferable to having part of the train under air and part under hand brakes.

H. A. VAUGHAN.

The Structure of the Quaker City Elevated Railroad.

TO THE EDITOR OF THE RAILROAD GAZETTE:

If the proposed structures of the Quaker City Elevated Railroad are correctly delineated in the *Railroad Gazette* of Dec. 16, 1892, it is not altogether unfortunate that the courts have decided that for the present the structure cannot be built. Pending the discussion of this question, an opportunity will be afforded to the company to revise their plans and perfect a design which will not have to be altered as soon as the trains begin to run over it.

The longitudinal elevation of the structure shows the design to be that of a series of six legged tables each with two leaves and the ends of the two adjoining leaves resting in expansion pockets, on a transverse girder not otherwise stayed. This plan of structure has been tried and has failed. On running a train over a structure thus built, the deflection at the loose ends of the girders as the wheels pass alternately from one to the other causes a marked depression of the ends of the girders and a consequent oscillation of the cross-bent which is not at all agreeable to witness and is very suggestive of weakness in the structure. This can only be obviated by riveting one of the loose ends to the cross-girder, thus making the structure an eight-legged table with one leaf resting on the next rigid similar table.

It will be far more satisfactory to the engineers, contractors, and the public along the line of road, to have this change of plan made before the structure is erected, instead of having to do it after the road has been put in operation.

X. X.

British Canal and Railroad Competition.

BY J. S. JEANS.

In most of the principal countries of Europe there has within recent years been a resurrection, to a greater or less extent of the system of transportation by water, in competition with the transport by railroad. This revival has been mainly due to the keenness with which traffic of all kinds is being competed for, and the ever narrowing margin of profit upon which the business of transport must now be worked. It is not that the promoters of the transport by water—whether those who "moved a mighty State's decree," as in the cases of Germany or France, or those who are the humble traders on the waterways of other countries—are dissatisfied with the conditions of transport by railroads which are probably, on the whole, more perfect and better adapted to the special wants of the country than will be found elsewhere; but it is felt that the railroad companies continue to charge much higher rates than are charged, or ought to be charged for canal transport, and the canal companies are expected to give the chance of choosing between the comparatively high rates actually levied by the companies, and the comparatively low rates at which the railroad companies are expected to work.

The advocates of canal transport in Great Britain and the continental countries start with the assumption that under ordinarily favorable conditions water carriage is and must continue to be, cheaper than transport by land. But they forget that there is canal transport and sea transport, and that between these two there is a great gulf fixed. Enormous quantities of grain have been carried between New York and Liverpool for 10s. per ton or an average of .04d per ton per mile. Between the North Sea and Baltic ports grain freights have been equally low, and have over long periods failed to rise higher than 0.08d. per ton per mile. Including depreciation, insurance, fuel, wages, and food, the cost of transport by a modern cargo steamer has been stated by authorities to be only a penny for forty miles. On the river Weaver, between Northwich and the Mersey, salt is regularly carried for a distance of thirty-six miles for sixpence a ton, which is at the rate of 0.17d. per ton per mile, which is about one-sixth part of the average rate for railroad traffic in the manufacturing districts of Great Britain. On the Leeds and Liverpool canal, where the conditions are not very favorable to cheap transport, the average cost of towing two forty-ton barges, fully loaded, using steam haulage has been given officially at one sixth of a penny a ton-mile, but under much more favorable circumstances, on the Aire & Calder canal, which serves the manufacturing districts of Yorkshire, the cost of hauling a train of barges, fully loaded, by steam, has been brought down to a penny [a ton?] for 119 miles for mineral traffic, and to a penny for thirty-four miles for general traffic. These are, of course, exceptional conditions, but there does not appear to be any reason why they should not be reproduced on a large scale.

As it is, the actual cost of canal transport is generally found to be much above the figures quoted. On the canal system of Great Britain generally, using horse power for traction, the cost of canal transport is understood to be almost, if not quite, as high as that of railroad transport. A recent official report places the cost of carriage on the Elbe canals, in Germany, at 0.35d. per ton-mile, and on the canals that lead from the Belgian coal fields to Paris the rate is given as 0.29d. in the spring, and 0.34d. in the autumn, per ton-mile, without taking account of interest on capital. On the French canals the cost of steam transport is given as 0.38d. It has been stated, again, that the cost of transporting wheat between Chicago and Buffalo by the large steamers that now navigate the lakes is not more than two cents per bushel, or about 8d. per quarter for a distance of something like 800 miles. On the canal journey from Buffalo to New York, however, the cost of transport is stated to rise to twice this sum, with more than twice the time in transit for only one-half the distance. On this showing it has been contended that an improved Erie canal is required, and that if such a waterway were provided transport would be still further cheapened between Chicago and New York.

The figures quoted show conclusively that the cost of water transport may be, and indeed actually is, almost any figure from nearly one halfpenny to less than the hundredth part of a penny per ton per mile. But the cases, after all, are rare in which the canals, whatever the rates that they have charged, have been able to exercise any sensible influence on the rates charged for railroad transport. In Great Britain, indeed, the railroad companies, through their responsible heads, regard canal competition with something like contempt. The canals are not generally a factor to be reckoned with in fixing railroad rates. Even the best of the canals are to some extent under railroad control. The Birmingham Canal Navigations may be cited as a case in point. Although nominally an independent company, the enterprise has for a considerable time past had an agreement with the London & Northwestern, providing that the latter will guarantee a 4 per cent. dividend, on the condition that the canal rates shall not be changed without the railroad company's consent. Not only so, but the railroad company has the right to nominate a certain number of directors on the canal board. Numerous cases of the same kind occur, so that the railroad companies have been strong enough and sagacious enough to practically strangle any active competition on the part of the canals. And with what result? At the present time, something like 90 per cent. of the internal commerce of the United Kingdom is carried by the railroad. The canals have been struggling along, barely earning a precarious and uncertain livelihood, except as regards one or two specially well-managed and successful concerns.

It is the same on the continent of Europe. The German canals carry some 20 millions of tons of traffic a year, but the railroads carry more than six times that quantity. In France the railroads carry about five times as much traffic as the waterways, and in Belgium and Holland the comparison is equally unfavorable to canal transport. In none of these cases is it pretended that canal rates have any sensible influence in fixing railroad rates generally. No doubt, in some cases special rates were made to meet the conditions of water rivalry, and this may be the case with such well managed concerns as the Aire & Calder, but the cases are so few that they do not affect the generalization we have made. Nor is the case different in the United States. In spite of the fact that the all-water rate from Chicago to New York is much under the all-rail rate, the railroad has al along secured the lion's share of the traffic. The railroad companies have, it is true, on this route, as on American lines generally, greatly reduced their rates of freight within recent years, but this was due to entirely different causes, and especially to the very active competition that existed among their own lines. Railroad managers generally do not admit that even on the Chicago and New York route the competition of lake and canal has been the main instrument in bringing rates down, and in this contention they are supported by notable and irrefutable facts.

The question is often asked, in view of the facts to which attention is directed, are the canals, then, to be of no further use for purposes of internal transport. In the United Kingdom this question has been answered by traders in a most practical manner by sending over 390 millions of tons of traffic by railroad and about 36 millions of tons by canal navigation—including the canals belonging to the railroad companies. It has been answered by the canal companies themselves by failing to make it worth the while of traders, except over a very limited area, to send traffic on to their system. In some few cases canal companies do, indeed, impose very low rates of toll, but in other cases they are abnormally high—higher than the railroad rates, as a general rule. As a case in point, which might, however, be reproduced very largely, it may be mentioned that a trader who might desire to send ironwork from London to Liverpool by canal would have to deal with no fewer than six canal companies, who charge tolls varying from 2d. to 1s. 9d. per ton between the Thames and Preston Brook, a place within 20 miles of Liverpool. If, however, the traffic is to be carried beyond that point, it has to be transhipped into larger craft, on the famous Bridgewater canal, where for the remainder of the distance of 20 miles or so it has been the custom to charge about 7s. 6d. per ton, or more than the other six companies have charged for conveying the traffic about 11 times the distance.

There are four or five different water routes between London and Liverpool, besides the splendid services of the London & Northwestern and the Midland Railways, and yet the canal companies charge not less than 20s. per ton for carrying ironwork over this comparatively short distance, being over a penny per ton per mile. Naturally, under these circumstances, the canal companie do not get the traffic, which is almost entirely absorbed by the railroads.

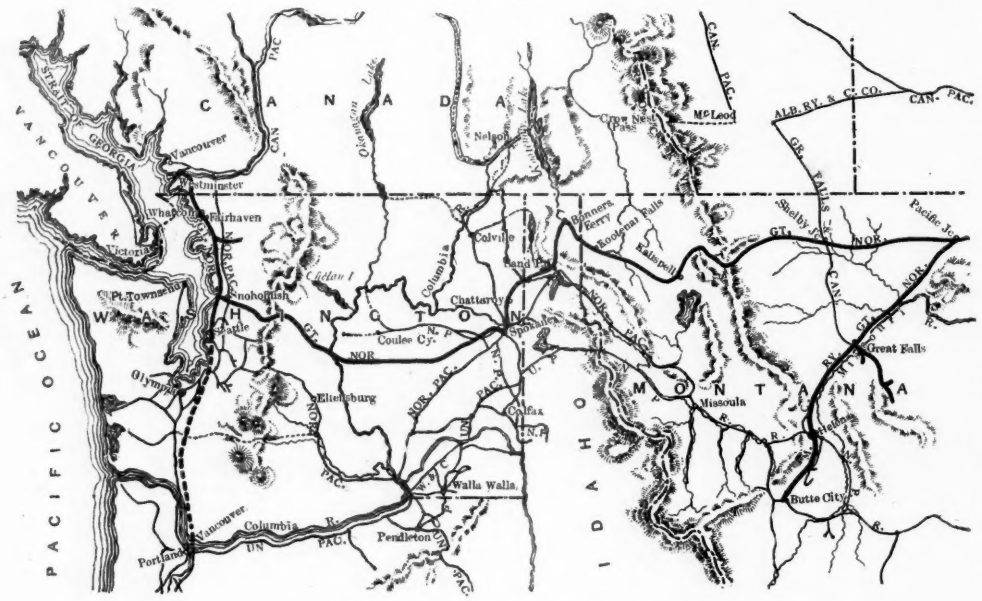
Whether the canals could do better if they were widened, deepened and improved, if they were under systematic control and had an adequate and uniform gauge, is a point that cannot be answered in England from large experience. Indeed the only real experience at command is that of the Aire & Calde r Navigation Co. in Yorkshire, who carry on a very successful business indeed, own their entire length of 93 miles, although they can only take boats 120 ft. long by 18 ft. wide and 7 ft. 6 in. draught and have to contend with 30 locks, or one lock to every three miles. This company has a total subscribed capital of £2,371,000, carries 2,210,000 tons of traffic and has a total gross revenue of £248,000. This is one of the few companies in Great Britain that uses steam power, the only other canals that employ this power being the Grand Junction, the Grand Union, the Leeds & Liverpool, the Leicester, the Louth, the Bridgewater, the Oxford and one or two others. The total capital embarked in the independent canals of England and Wales is stated at £27,750,000, and as the net profit is given on the whole as £578,000, it cannot be claimed that the companies carry on a very rosy business. The actual income accruing to the canal companies from the carriage of freight is small, amounting, for England and Wales, to not more than £433,000, while £741,000 is earned from tolls and £265,000 from other sources. There has been some talk from time to time of freeing the canals from the payment of tolls, as is done in France and in the case of the New York State canals, but, of course, this could not be done unless the interests of the shareholders in the canals were provided for and it would be difficult to provide for these unless the State became the owner of the property—which would probably never be allowed in the United Kingdom.

The canal outlook, therefore, appears to be almost hopeless, unless private enterprise provides the necessary capital to construct canals of much larger capacity, on a basis adapted to present day requirements. This is being already done to some extent by the construction of the Manchester ship canal; but this enterprise, which was originally estimated to cost about six millions sterling, or an average of about £200,000 per mile, has from one cause or another, absorbed a very much larger capital, until it is now believed that fully 16 millions sterling will be required to complete it, being an average of some £443,000 per mile, or about nine times the average

cost of the construction and equipment of the railroad system of England and Wales, enormous and exceptional though the cost of that system be. If the whole 4,000 miles of canals and canalized rivers in the country were to be modernized in the same way at the same cost, it would involve a total expenditure of some 1,772 millions sterling, which would be almost twice the amount embarked in the railroad system of the country. This, of course, has only to be stated, in order to be at once dismissed. Some competent engineers, again, have estimated that an expenditure of £12 000 per mile would place the canal system of the United Kingdom in a fairly efficient and satisfactory condition, but it is doubtful whether so small an expenditure would enable the system to carry any very large increase of traffic. However this may be the traders in the principal inland centres have been seriously discussing the subject of extending and improving the principal lines of waterway, and now that a more intelligible schedule of maximum rates and a fuller and better classification is being fixed, something tangible is likely to be done in this direction.

Pacific Extension of the Great Northern.

The track of the Pacific extension of the Great Northern will probably be joined next week, the connection between the eastern and western divisions being made at a point in the Cascades, a few miles west of the switchback over the mountains. The accompanying map shows the location of the extension approximately. No accurate map has yet been issued, and a few changes have been made in the location since the map from which the engraving is copied was made.



The Pacific Extension of the Great Northern.

The following description of the route is condensed from an article by Charles Hallock in the *Evening Post* (New York) of Jan. 2.

Fort Assiniboin, in Montana, was a strategic post in the Indian country soon after the Custer massacre. Today it has almost lapsed into desuetude, and become, as it were, little better than a sentry box at the mighty gateway of the Marias Pass. From this advantageous point of departure the Pacific extension of the Great Northern Railway makes its way across the old debatable ground through eastern Montana, Idaho and Washington to Puget Sound; and the beginning of the year 1893 witnesses its successful completion. By this new transcontinental route an easy way is opened with the most picturesque mountain regions of the United States. The track either crosses or flanks no less than five distinct ranges, to wit: the main Rockies, the Missouri, Cabinet, Selkirk and Cascades, all of them intensely alpine in their features, presenting the rugged aspects of Switzerland in manifold and surpassing them in extent, magnitude and majesty.

The thrifty town of Havre, with its 600 population, has grown up within two years at the Pacific junction, near Fort Assiniboin, just where the line to Great Falls and Helena branches off to the south, and as soon as the tourist reaches this point he is treading the threshold of a new creation, and may look forward to new things. Here the rolling prairie gives place to a formation much cracked and grooved with gullies, drains and coulées, and at Cut Bank a bridge is swung over a creek 250 ft. deep, with a sinuous stream as green as emerald flowing through the bottom. Simulations of mountain ranges loom up betimes on the horizon and successively fade away as the train speeds on. Long reaches of grazing land intervene, dotted with great mounds of hay, and herds of horses and cattle feeding on the uncut grass. At Galata, 115 miles east of the summit, the first glimpse of the Rockies is had. At sight the range appears but a spectral silhouette upon the horizon, but at each successive station the jagged outline looms up higher and gradually becomes distinct. Patches of snow begin to brighten up the higher peaks. Somber areas of forest define the line of frost. Thence onward our interest in the approach momentarily increases. . . .

Up the eastern slope, by grades so easy as to be scarcely perceptible, the train pursues its devious way, through foothills embroidered with gaudy autumn foliage; past upland meadows, broadening ponds and brawling streams; by many a viaduct and curve and cut, to higher and higher elevations which bristle betimes with crags and precipices. Flag stations occur at six-mile intervals on an average, comprising a section-house, water-tank and windmill, and sometimes a steam pump with an occasional cattle chute and freight house. Here and there the nucleus of a town has formed, and there are stores, saloons and dwellings. Trails lead off from each station to isolated ranches and river crossings. . . . In the mountain districts the ravines near the track are choked with the remains of old construction camps. Miles upon miles of corduroy road employ no traffic. Bridges more or less dilapidated have outlived their usefulness. A litter of tin cans, broken barrows and empty powder kegs strew all the lines of progress.

On Sept. 24, at two o'clock p. m., we are at Blackfoot, 35 miles east of Summit. The atmosphere is calm and sunny, and the temperature stands at 65 deg. in the shade. Chief Mountain, with its scarred face, lies off to the right, a chain of almost equal elevation extends away to the left, and Marias Pass lies directly in the centre before us. At Durham, 21 miles from Summit, we are well advanced into the foothills, and the landscape is circumscribed. Anon the hillsides begin to show a growth of brush and trees ten feet high, and all yet green, contrasting agreeably with the sun-browned grass. Twelve miles farther up, at Midvale, altitude 4,400 ft., shovelers on the track are working in heavy woolen shirts and mittens, with caps and ear-muffs. They are Italians. The ground is wet with melted snow, and the roadbed glistens in the moisture with a mosaic of gaudy pebbles, red, blue, green, yellow, pink, purple and gray, which form the ballast of the road. Chromatically it is the most beautiful roadbed in the world. Still higher up damp clots of snow line the track, and the foothills are white to their bases. Trees of sturdy growth now replace the shrubs and the scenery becomes varied and picturesque. . . .

Cañons flanked by vertical walls lead up to high benches and tablelands. High bridges cross deep chasms. Cascades tumble into ravines. One bridge, over Two Medicine Creek, is 214 ft. high, with a span of 140 ft. Six miles away are the celebrated Two Medicine Lakes, noted for their grand environment and their game and fish. At the culmination of the pass the altitude is 5,200 ft. It is four o'clock p. m. Snow covers all the ground. The temperature is 42 deg., a rapid change from summer to winter. In the morning it was 32 deg. The railroad company has a weather observatory here, also a section house, tank, roundhouse, turntable and repair shop. It is a picturesque location, but airy. At this supreme elevation the visitor gets out of the cars expecting to look back along the grade which he has just ascended, or forward down the Pacific slopes, instead of which he discovers all around him a level park of several hundred acres inclosed by an amphitheatre of peaks which rise 3,000 ft. above him still. . . . Summit Creek winds through this broad plateau and empties into Bear Creek, and the railroad, following in its sinuosities, makes a tremendous sweep, like a big double S, in one bend of which is located the notorious McCartyville, a collection of 40 log shacks, without a tenant now, but a seething Sodom of wickedness when it was at the front. . . .

Down from the summit the grade is rapid, and in ten minutes we are out into sunshine, 440 ft. lower down. By five o'clock the temperature is warm again and no snow is visible except upon the high peaks. Five stations are passed successively amidst the wildest alpine scenery. Little depots are tucked away into clefts of the rock, and there is hardly room for the track. The mountains are conspicuously higher than on the eastern side and more serried, running up into grand domes, pyramids and cones. Here also the chasms are deeper, the streams wider and more impetuous, the areas of the forest more expansive, and the engineering difficulties more taxing. There are heavy rock cuts and several tunnels. The walls of some cuts are of variegated shades—red, drab, gray, green and yellow—looking as if freshly painted. For 50 miles the track follows the rocky channel of the Flathead River, swinging ever and anon over deep chasms, rounding sharp promontories, groping through defiles. The whole journey is like a phantasmagoria, but the speed is too rapid to allow more than glimpses of near objects; shades and colors all run together. But for distant views the outlook is superb, mountain after mountain looming up through valley vistas and continually presenting different aspects, like the facets of a gem. Belton Station, 45 miles west of the summit, is the point of departure for Lake Macdonald, which is destined, as soon as known, to become one of the foremost mountain resorts in America. Its features are all alpine, and it is comparable only with Lake Luzerne in Switzerland. It is 18 miles long by four wide, and occupies an abyssmal fissure in the very heart of the Rockies, whose depth has been partly tested but never ascertained.

Each intermural depression lying between the parallel mountain ranges which belt the Pacific slope carries an independent fluvial system, with extensive ramifications of which a large, deep lake is always the conspicuous central reservoir. Several of these lakes are from 80 to 190 miles long, and the melting snow in spring raises their normal level from 14 to 20 ft., and they are so deep as to be practically bottomless, anchorage being impossible. The rivers are mighty, too, and big steamers ply on all of them. The Columbia has few peers. The Kootenai is 600 miles long, with 267 miles of steam navigation. The Pend d'Oreille is one of the largest rivers in the Northwest. The Spokane has a shore line of 600 miles, begirt with heavy timber. Then there are the Cœur d'Alêne, the Okanagon, and Chelan lakes, larger than those in northern New York). . . .

All the rivers are very erratic; but though they flow to every point of the compass in their quest for a passage through the mountain mazes, a considerable stretch of each one happens by a noticeable coincidence to have an east and west direction on very nearly the same parallel of latitude, so that together they form a sort of chain-stitch from the Rockies to Puget Sound. And the Great Northern Railway, in choosing its route, has first laid it along the course of the Flathead for 50 miles, then along the Kootenai for 63 miles, then along the Pend d'Oreille for 28 miles, then along the Little Spokane for 24 miles, then along the Columbia for 60 miles, and finally along or near to the Chelan outlet and lake shore for nearly an equal distance, distancing each one and making the entire interior system of waterways directly accessible from its line.

Each district is rich in ore and minerals, and consequently active commercial towns and shipping ports have formed at eligible points, and all are bound together even now not only by waterways, but by intermediate links of railroad, substantial wagon roads, telegraph lines, canals and other means of intercommunication.

The Ammonia Railroad Motor.

A new system of propulsion for street railroads and other analogous uses has been recently introduced by the Railway Ammonia Motor Co., of New York, and is illustrated in the accompanying engravings. The new motor in many respects resembles a steam motor or dummy, but contains no fire, and emits no exhaust to the atmosphere. It, therefore, makes no smoke and no exhaust steam.

Anhydrous ammonia instead of water is the vehicle by the evaporation of which heat is converted into work. The ammonia is evaporated, not by fire, as in a locomotive, but by hot water, which need only have the moderate temperatue of 80 deg. Fahr. The heat contained in the water is transmitted to the ammonia to evaporate it, and the resultant steam or vapor from the ammonia is utilized in cylinders and by pistons, which propel the motor as in an ordinary steam motor or locomotive.

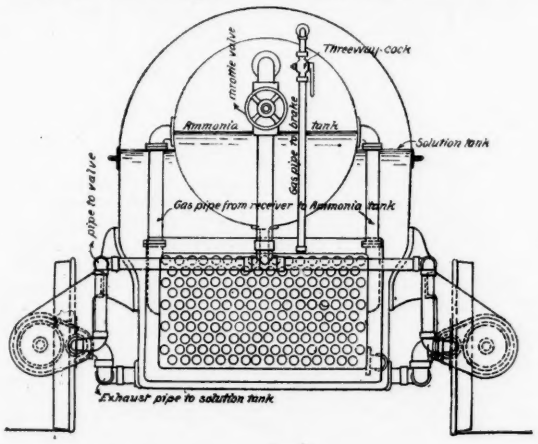
The exhaust from the cylinders is not sent into the atmosphere, but into the hot water, which has been the source of heat whereby the ammonia was evaporated and converted into a high pressure vapor. Stranger still, the temperature of the water is found in actual experience to be slightly higher at the end of the trip than at the commencement.

All this seems to one used to steam engines for a lifetime to be passing strange if not absurdly impossible, but anhydrous or practically pure ammonia is a liquid which has many singular properties. Most of us are so used to water, with its immense heat-absorbing properties before showing the result in rise of pressure or the formation of steam that it is difficult to realize that anhydrous ammonia boils under atmospheric pressure at a temperature of 38.5 deg. Fahr. below zero, and that at a temperature of 80 deg. Fahr. it has a pressure of 150 lbs. per square inch. Another peculiar property of ammonia is that water can absorb 1,700 volumes of ammonia, a truly marvelous example of complete saturation. The ammonia of commerce, termed "aqua ammonia," is a mixture containing 70 per cent. water and 30 per cent. ammonia. It is ob

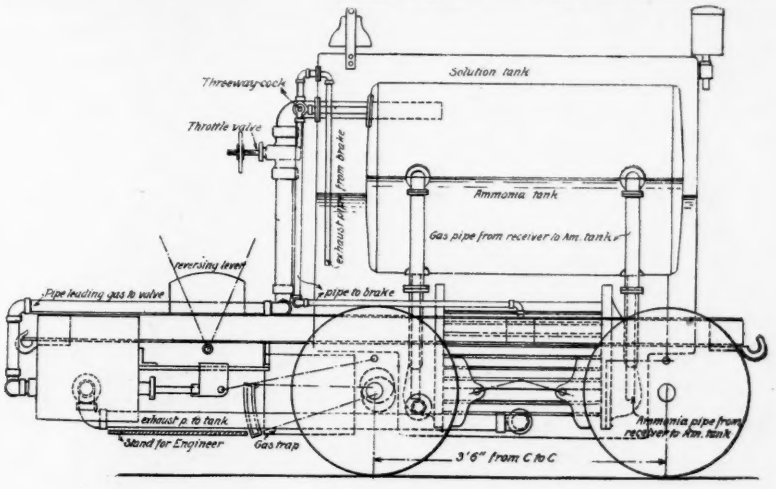
vious that a liquid which yields a high pressure vapor at the moderate temperature of 80 deg. Fahr. must possess many advantages as a medium for converting heat into motion, and that the amount of heat needed would probably be small. The method by which the system is worked in the motor under notice is as follows.

A stationary plant is used to separate ammonia from the aqueous solution of ammonia and thereby furnish anhydrous ammonia. The ammonia is expelled from the solution in a still, as a gas, at a temperature of 90 deg. Fahr. below the boiling point of water. This gas passes through condensing coils over which cool water is sprayed, where the gas is reduced to a liquid (anhydrous ammonia) and from there runs off into a tank in much the same manner as fresh water is condensed from salt water at sea. The water, or weak solution from which the ammonia has been expelled, is blown off into a separate tank.

The motor machinery, in addition to an ordinary engine, consists of a tank with an ammonia reservoir contained within it. In charging the motor the ammonia is charged into the reservoir, and the water or weak solution is charged into the outer tank.

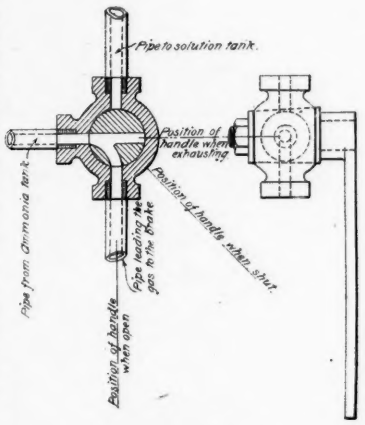


Cross-Section.

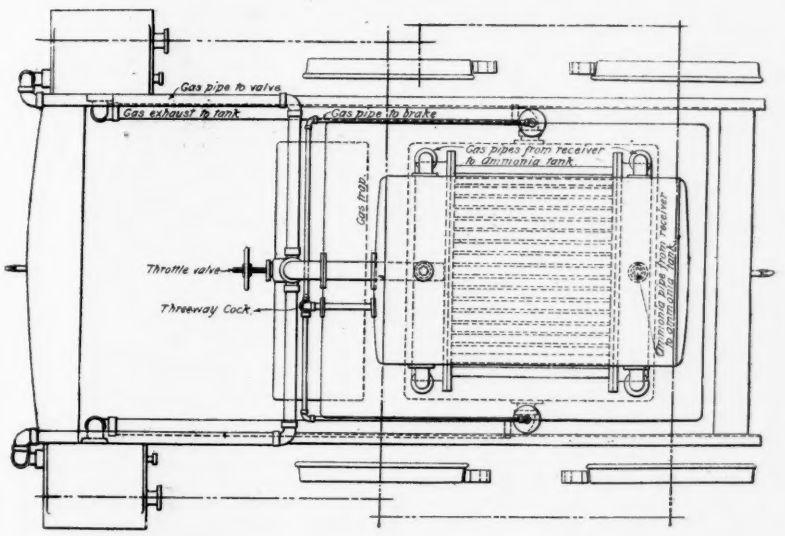


Side Elevation.

As previously stated, the boiling point of anhydrous ammonia under atmospheric pressure is 38½ deg. Fahr. below zero, and at a temperature of 80 deg. Fahr. it gives a pressure of about 150 lbs. per square inch. The outer tank is charged at a temperature of 80 deg. Fahr. The pressure pipe from the reservoir leads to the engine, the exhaust from which is led into the bottom of the absorbing solution in the outer tank, where the exhaust gas is instantly absorbed. The latent heat of the gas is given out in the absorbing liquid, and this heat is being continually transmitted through the metallic surfaces of the inner reservoir to keep up the evaporation, as long as any of the anhdrous liquid remains in the reservoir. When the stored power of a charge is expended, the contents of the outer tank will have become a concentrated solution of aqua ammonia; this is withdrawn at the stationary plant to be reseparated, and a new charge introduced; thus the material is used over and over again, indefinitely. No fuel is consumed except in effecting the separation of the liquids at the stationary plant.


Pipe to solution tank.
Position of handle when exhausting
Position of handle when shut.
Pipe from Ammonia tank
Pipe leading the gas to the brake
Position of handle when open

Brake Valve.


Gas pipe to valve
Gas exhaust to tank
Gas pipe to brake
Gas pipes from receiver to Ammonia tank
Gas pipe
Throttle valve
Three-way Cock
Ammonia pipe from receiver to Ammonia tank

Plan.

McMahon's Ammonia Railroad Motor.

This system is the invention of Mr. P. J. McMahon, formerly a Chief Engineer in the U. S. Navy, who has devoted several years to perfecting the Ammonia Motor and adapting it to street car propulsion. It is claimed that trials made show that the cost of preparing the anhydrous ammonia for use at the charging station is less than one cent per car mile, which is undoubtedly a very low figure when compared with the cost of other means of propulsion. The loss of ammonia by leakage and waste, as stated to be not more than 10 per cent. per annum is shown by the results of well equipped refrigerating machines in which ammonia is used.

When used under an ordinary 16-ft. street car the apparatus weighs, when charged, no more than the electric apparatus on a trolley car of the same size, and a sufficient charge can be carried for 25 miles, while it is claimed that with an independent dummy car, as shown, the charge will be sufficient to run double that distance. Tests made with a McMahon ammonia motor car, at Chicago, show a consumption of less than 4 lbs. of coal and 3.4 gallons of ammonia per mile run, the cost after some improvements were made in the valve gear being only .8 cent per mile.

Tests in England with a car loaded to represent the weight when full of passengers, showed a consumption of fuel in separating the ammonia of only .43 of a cent per mile, these tests being made by Mr. George Hopkins, of Westminster, London, a well known authority on street railway propulsion.

The motor shown in the illustration has been recently constructed and will be put into service on a New York City railroad. It is from the designs of Mr. T. W. M. Draper, Chief Engineer, of the company. The brake is actuated by the ammonia vapor in a precisely similar manner to a steam brake and the operating valve is shown in detail in our illustration.

It may be mentioned that ammonia has a strong corrosive effect on copper and that therefore no brass is used in contact with the ammonia. It has a slow corrosive action on rust or oxide of iron, but none whatever on metallic iron. It is found that where care is taken in making pipe joints, etc., they keep perfectly tight, but it is necessary to avoid using rusty rivets or any corrosion on the screwed portion of pipe fittings. In practice it is believed that the leakage can be reduced to an extremely small figure. The fact that Pintsch gas reservoirs and fittings keep absolutely tight, without any loss of pressure for several months, is a proof that leakage can be practically absolutely prevented when dealing with gases of moderate temperature under high pressure.

This power can be used for various purposes, and seems to be peculiarly adapted to the propulsion of street cars, where any number can be operated from a central station with this stored power which is always ready for instantaneous use. Among the great advantages for this purpose may be mentioned the fact that there is no fire on the motor, and no escape into the atmosphere. No alterations or additions are required in the present tracks, nor need the present cars be altered in any particular.

This company has located at No. 136 West Twenty-eighth street, New York, a plant which will soon be ready for inspection.

Shop Notes—Richmond & Danville, at Atlanta.

Architectually speaking, the shops of the Richmond & Danville, at Atlanta, are not of such a character that they would be taken as models of the most approved modern practice in construction and management, but, like all other shops, they shelter peculiarities and wrinkles of their own, which are valuable and worthy of imitation.

For instance, if you should happen along at the right time, you would see a locomotive jacked up so that its wheels were some four or five inches from the rails, and undergoing the process of a renewal of its tires. The apparatus by which the work is done consists of a portable gasworks and a hoop burner, which encircles the tire. The gasworks are placed upon a four-wheeled car and consist of a furnace where soft coal is burned; of four retorts, and an oil tank with suitable piping. The oil tank stands somewhat above the retorts so that its contents flow readily into them.

A pipe in which there is a small needle valve is placed in the pipe between the oil tank and the first retort for the purpose of regulating the flow. The oil, which is 150 degrees fire test kerosene, flows through three of the retorts, one after the other, where the heat converts it into gas. The fourth retort is used for heating the air supply, which is brought in under pressure from an air pump located in the shops. After leaving the retorts, the hot air and gas are brought together and led directly to the hoop burner at the wheel. Valves in the supply pipes regulate the proportions of air and oil, so that the flame which impinges upon the tire can be blued down to that of a Bunsen burner. It takes three or four men to attend to the machine and do all the other work, depending on the kind of engine being operated upon. It requires from one day to one day and a half to renew the tires on a mogul engine. Since the adoption by the Master Mechanics' Association of the standard sizes for locomotive driver centres, all of the engines on the Richmond & Danville have been equipped with centres turned to these standards. Hence, when a set of tires need re-turning the engine is jacked up, the worn tires removed and fresh substituted, while those which have just been taken off are shrunk upon blank centres for re-turning, so that the engine is only delayed for the time that is actually required for the substitution of the fresh for the worn out tires.

In the lining up of driver boxes a plate, in halves, bolted to the inside face of the worn hub of the driving wheel, with countersunk bolts the holes for which are filled with babbitt metal. This, apropos of the October discussion of the New York Railroad Club.

Cast iron guides are extensively used. They are made very wide and are ribbed upon the back in order to secure the requisite stiffness. A wrinkle in connection with these guides worth noticing is the provision which is made near the centre for attaching the indicator rigging. To be sure, comparatively few locomotives are ever subjected to indicator investigation, but when the work is to be done, a proper place to fasten the rigging is apt to assume the prominence and desirability of the Texan's revolver.

Most excellent results are being obtained by tinning the rubbing face of the crosshead with a veneer of tin about one-sixteenth-inch thick. This wears remarkably well, is inexpensive in first cost and in repairs, and keeps the crosshead up to its original alignment. For passenger service, some all-brass crossheads are used, and it is needless to say that they give good results.

At the back end of the yard there is a line of pipe, with

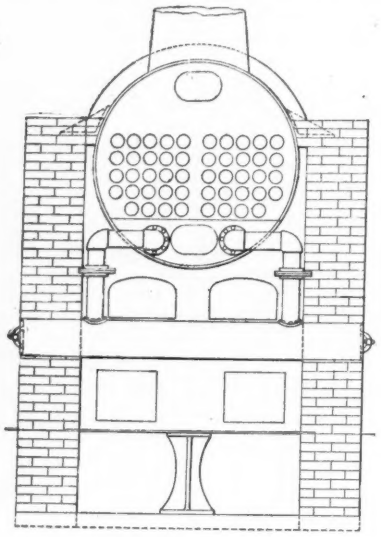


Fig. 2.

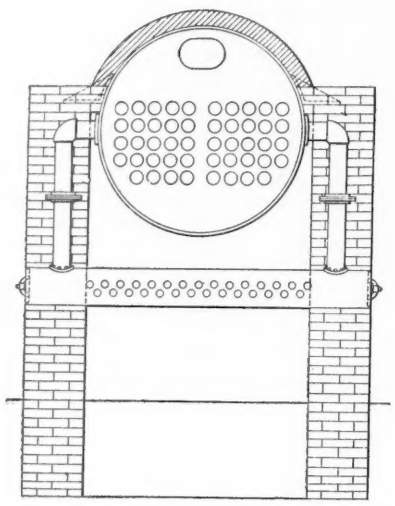


Fig. 3.

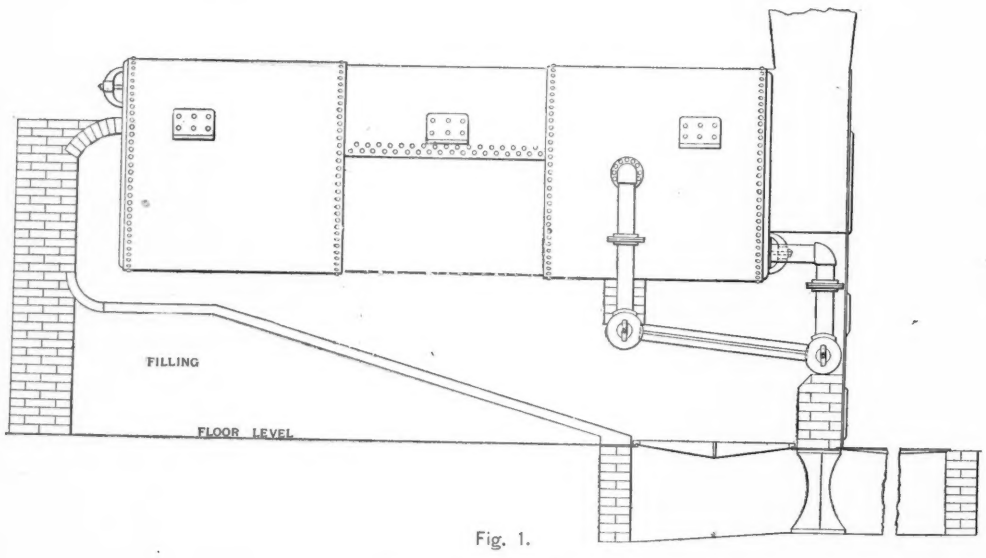


Fig. 1.

Hawley Down-Draft Furnace.

suitable hydrants at convenient intervals, which is used for washing the passenger cars.

Considerable trouble has been experienced here by the breaking of the bolts that hold the frame braces in position. This has been entirely obviated by Mr. Gibbs, who has thickened the pedestal leg so as to use a longer bolt of the armor plate style. This bolt being longer is made smaller at the centre of its length, so that if any bending occurs the metal takes an easy curve from end to end and there is no danger of the concentration of the vibrations at one point with the resultant crystallization and fracture that is sure to follow.

The Hawley Down-Draft Furnace.

The Hawley furnace has now been in use for several years and has given excellent results with stationary boilers, both in economy and as a smoke preventer. The construction of this furnace as applied both to ordinary cylindrical, tubular boilers and to stationary boilers of the locomotive type is clearly shown by our illustration. Referring to figs. 1, 2 and 3, it will be seen that the furnace consists of two grates, of which the upper one is a water grate from which connections to the boiler are made by two drums and suitable connecting pipes. The details of this construction have been varied to some extent in applying it to different boilers, and to stationary boilers of other types, water legs having been used in some cases instead of the pipe connections.

The construction of the furnace as applied to a locomotive boiler for stationary use is shown in the remaining illustrations, figs. 4 and 6. In this case the tubes of the water grate are secured in the back sheet of the firebox at one end, and into a drum 10 in. in diameter and extending across the firebox at the other end. This drum is connected with the main part of the boiler by a 6-inch vertical pipe which passes through the crown sheet, and which is surrounded by a bridge wall constructed between the crown sheet and the drum. The arrangement of the lower grate in this form of boiler is clearly shown in the illustration.

In using this furnace the fresh coal is charged on the upper grate and is partly consumed there, the remainder dropping through to the lower grate where the combustion is completed. The main supply of air for combustion enters through the furnace door above the upper grate and therefore passes down through the fire on this grate and then over that on the lower grate to the chimney. Some air is supplied below the lower grate. The practical result of this is that the combustion is very complete, and that a large amount of coal can be burned under the boiler as compared with other

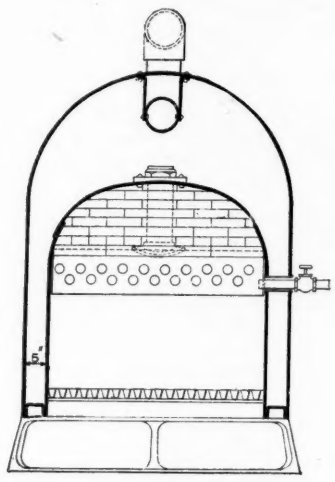


Fig. 5.

smoke preventing furnaces. This possible rapidity of combustion is an important feature which we believe has not been satisfactorily accomplished in any other form of smoke preventing furnace. It is of particular importance from the fact that for commercial reasons it is desirable through the Central states where cheap bituminous coal is used that a high rate of combustion should be maintained. In other words, commercial economy in steam production demands that a large amount of coal should be burned per square foot of grate surface, and that the boilers

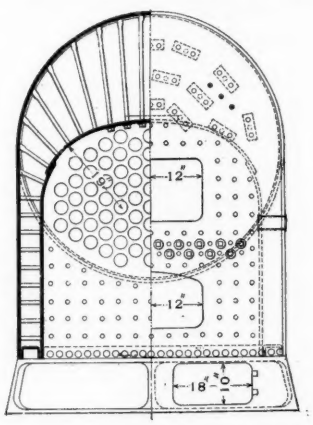


Fig. 6.

should be forced to some extent. A rate of combustion as high as 45 lbs. of coal to square foot of grate has been obtained with the Hawley furnace, and a rate exceeding 30 is by no means uncommon. In considering this, however, it must be remembered that the grate surface of the single grate of the Hawley furnace, as usually constructed is somewhat less than that of the ordinary plain grate.

Many of the best results with this furnace have been obtained in tests made by well known engineers, who had no interest in the furnace whatever, and the rate of combustion secured has in many cases been quite surprising to the engineer making the test. We add a

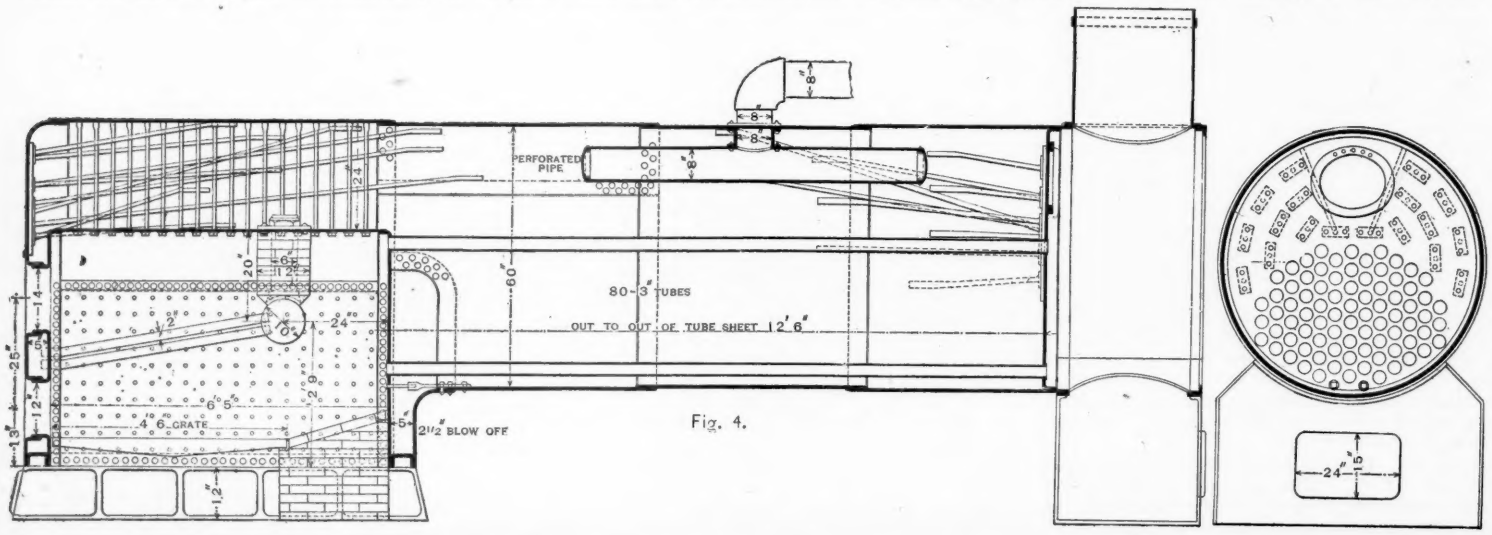


Fig. 4.

"Economy" Internally-Fired Boiler, with Hawley Down-Draft Furnace.

TESTS OF HEINE BOILERS AT THE CHICAGO EDISON PLANT.

Date	Sept. 14	Sept. 15	Sept. 16	Sept. 17	Sept. 7	Sept. 21
Kind of furnace	Hawley	Hawley	Hawley	Hawley	Jarvis	Jarvis
Duration of test, hrs.	6	6	6	4	6	5
Grate surface, sq. ft.	49.5	49.5	49.5	49.5	54	54
Rated horse power	329	329	329	329	329	329
Horse power developed	576	523.5	436.2	351	497.2	485.5
Kind of coal used	New Kentucky	New Kentucky	Mt. Olive	Hazel screenings	.75 New Kentucky .25 Anthracite pea	Youghiogheny
Coal burned per hour, total lbs	13,200	10,800	10,550	6,500	12,000	7,500
Coal burned per hour, per sq. ft. grate	44	36.3	35	32	37	27.8
Steam pressure	113.5	114.3	115.2	114.5	114.1	112.9
Temperature feed water	66	66.5	66	66.2	72.3	68
Evaporation per lb. coal, actual	7.55	8.21	7.16	6.29	7.22	9.36
Evaporation per lb. coal, from and at 212°	9.03	9.81	8.56	7.51	8.58	11.17
Relative H. P. developed	1.63	1.48	1.23	1.00	1.40	1.37
Relative cost of coal per ton	2.50	2.50	1.73	1.00	2.59	2.96
Relative cost of coal per H. P. hour	2.08	1.87	1,52	1.00	2.20	2.00

table showing tests made at the power station of the Chicago Edison Co. on Heine boilers with the Hawley furnace and with the Jarvis furnace by Mr. R. W. Francis, Chief Engineer of the Chicago Edison Co.

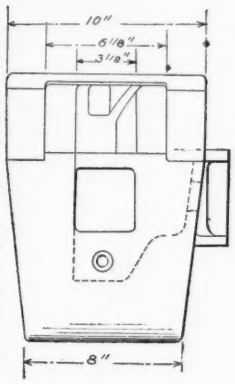
We are informed by Mr. J. R. Groves, Superintendent Rolling Stock of the St. Louis & San Francisco Railroad, that three locomotive boilers fitted with the Hawley furnace are in use at the Sprinfield shops of this company. One of these boilers has been in use for about nine years, and has been repaired by having the flues and water grates taken out on account of the scale which had accumulated. The other two boilers have been in service five years, and have had the flues renewed on account of scale, and the water grate has been renewed in one of them. In the other no repairs whatever have been made to grates. Mr. Groves says that they use nothing but slack coal, and find that they get about as good results as with good lump coal. The boilers are very satisfactory, as they generate steam quickly and freely with a poor quality of coal.

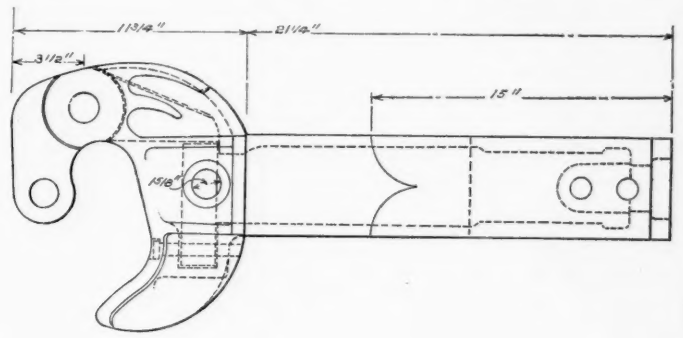
So much for the Hawley furnace as it has been tried in practice by disinterested engineers. On the other side we have the following from an interested promoter of the furnace. He says that it is proposed to make certain tests, in which the fuel used is to be slack coal and water, in the proportion of 6 lbs. of slack to 1 lb. of water. "Every pound of water thus consumed produces as much steam as a pound of fuel does."

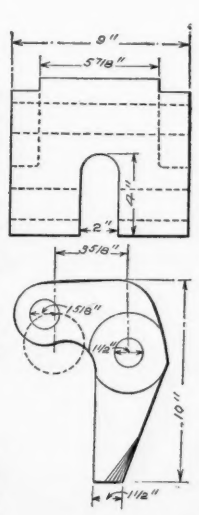
The American Car Coupler.

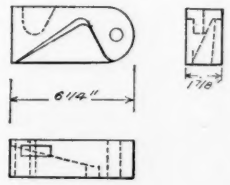
Another coupler is soon to be put upon the market, and this time it is one having some very good features. As shown by the illustrations the lock is a nearly rectangular block, cut away on one side to form an inclined surface. The lock turns about a horizontal pin when lifted to unlock. When locked the knuckle has a broad bearing, nearly two by three inches, on the end of the lock, and the pressure is transmitted to the head casting. In coupling, the beveled corner of the knuckle is pressed against the inclined surface of the lock and lifts it. The unlocking attachment is simply a link formed of flat bar iron, which is connected to the lock by a bolt as indicated in the view of the lock.

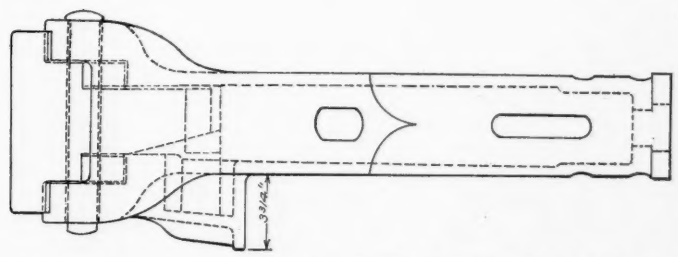
The weight of this coupler is given as 200 lbs. when made of steel, and 210 lbs. when of malleable iron. The knuckle weighs 50 lbs. and the lock 12 lbs. The office of the American Coupler Co is 468 Rookery, Chicago.











American Car Coupler—M. C. B. Standard.

The New Freight Rates in England.*

The regulations and conditions under which traffic is to be conveyed, and the classification of every commodity known to commerce into eight definite classes, will in future be absolutely uniform throughout the length and breadth of the United Kingdom. Hitherto the powers of the railway companies have had to be sought in a wilderness of some 3,000 private Acts of Parliament. From and after the 1st of January, as far as the rates for merchandise traffic goes, the whole of these obsolete enactments are swept away; the new classification, the new general conditions, and, more important than all, the new schedules of rates, are enacted in their place; and from and after to-day, Dec. 16, new rate books, drawn up in pursuance of the powers conferred by the new acts, will be accessible to the public at every railway station in England.

Even in a country where freedom broadens down as slowly as with us, 11 years is a good long time to spend on the preliminary arrangements for an alteration, however important. The time, however, has been by no means wasted, for the public have learned to understand better than they did before the rudiments of the question at issue. . . . . It must remain for the railway historian of the future to chronicle the final results of the controversy and to record the gains and the losses attributable to the final settlement. So far, it is all guesswork, and the guesses are, as might naturally be expected, widely at variance. One very competent observer looks forward to "a dislocation of trade of the country." On the other hand a veteran general manager light-heartedly quotes from the "Ingoldsby Legends" the lines:

> But what gave rise to no little surprise
> Was that nobody seemed one penny the worse.

For our own part we must confess to being by no means so sanguine. It may be true that at Rheims nobody seemed the worse, but it will be remembered that in fact the poor jackdaw suffered sadly and suffered unnoticed. And for our own part we cannot but fear that, though railway companies and traders may come off unharmed, the unfortunate consumer, who is always absent from these discussions, and consequently always in the wrong, will share the fate of the jackdaw. Rates have, it is admitted, been altered by wholesale. It is true, that, for a thousand instances in which they will be raised in future, there may be ten thousand in which they will be reduced, but, if the middleman does not put into his own pocket the whole of the reduction, while charging to the consumer twice the amount of each increase, he will very much belie his established reputation. . . .

The North Western, so Sir Richard Moon once told his shareholders, is estimated to have about 20,000,000 separate rates entered in its rate-books; and to revise 20,000,000 separate entries, each involving elaborate calculations and reference to the provisions of an extremely complicated Act of Parliament, is no slight task. . . . And settling the rates meant that one by one the whole of the 20,000,000 North Western entries had to be overhauled. There must be set down in each individual case—first, the rate as charged at the present time; secondly, the *maximum* as authorized by the new act; and, thirdly, the rate to be charged in the future. This new rate cannot, of course, be above the statutory *maximum*, but it may be equal to it, or it may be at any point below it. If the old rate was below the new *maximum*, in all probability it remains undisturbed. It is possible that the new rate, while below the *maximum*, may still be higher than the old, for revision does not necessarily mean reduction.

Effect on Revenue.—"But when all has shaken down what," the intelligent but general reader will naturally ask, "is likely to be the upshot of the whole affair?" A positive answer no man can give. The general managers, and even the goods managers themselves, can only guess and expect; but, broadly, it may be said that if things do shake down—and there is a good deal of importance in the "if"—on the basis of the present revision, the companies stand to lose a not inconsiderable amount of net revenue. The North Western adheres to the estimate presented a year and a half back to the Duke of Richmond's Committee, and figures out a loss of net revenue amounting to something like £70,000 per annum. The Midland is not far behind with a loss of something like £60,000; the Great Western reckons to lose well over £90,000. But this loss is very differently distributed in the case of different companies. In the case of the Midland, for instance, it is almost wholly in coal and iron. On the Great Western the loss on coal is less than a third of that on general merchandise. But, while the Great Western loss on merchandise is in the lower or cheaper kinds of goods, on the South Western it is the rates for pianos and velvets that are compulsorily reduced. Let us hope that the consumption of silk velvets at 30 guineas the dress may be much stimulated by the reduction of the cost of carriage of that article by 4s. 8d. per ton.

No one who has been conversant with the history of this whole business, who has watched the proceedings both before the Board of Trade tribunal and before Parliament, can have any words but those of praise for the ability, the unwearied patience, and the scrupulous fairness, both of Lord Balfour and Sir Courtenay Boyle and of the Duke of Richmond's committee. Better and fairer judges no man could ask for. If they have failed, it must be that success was impossible, and because the method adopted was radically wrong from the outset. And have they not failed, when actual rates have been taken as the standard for future *maximum* rates—when, in other words, a company has been fined for its liberality in the past? It is to the enterprise and the carefully moderated demands of the Midland Railway that the development of the great Nottinghamshire and Derbyshire coalfield is almost wholly due. Yet the Midland is to lose £60,000 of its coal revenue, while other companies, which shall here be nameless, are left with *maxima* that would have far more than covered the present Midland revenue, for no apparent reason except that while the Midland company were content, nine times out of ten, with low rates, they preferred to charge comparatively high ones all round. Is not the lesson of this revision patent to every railway manager, "Never reduce rates, lest your voluntary reductions of to-day be made a standard for the compulsory reduction of to-morrow"? And is this a lesson which it is wise in the public interest to teach?

But it will be said by the railway shareholders, as it was said both by Sir Michael Hicks Beach, and subsequently by the Duke of Richmond, "Cannot the companies raise the rates which are below the new *maxima* sufficiently to compensate them for the compulsory reduction of other rates?" Broadly, the answer must be in the negative. *Ex hypothesi* the companies have been charging already the rates which, in their judgment, were, as the technical phrase puts it, "what the traffic would bear"—in other words, the rate which, though it might not give them the largest profit per ton, would give them, they believed, the largest profit obtainable from the entire potential trade in any particular article. They believed, and will continue to believe till Dec. 31, that an increase of rate would cost them more, by curtailing the volume of trade, than it would benefit them, by increasing the percentage of profit per ton carried; and an act of Parliament coming into force on Jan. 1 cannot repeal an economic law. Broadly, therefore, the railway companies dare not raise rates, and it may safely be said that the rates at which the great bulk of the staple articles of the country's trade is carried will remain untouched.

In conclusion, let it be acknowledged that some good must be accomplished by all this elaborate revision. Whether, in order to get it, it was worth while spending two or three hundred thousand pounds on legal and clerical work, and withdrawing for two or three years the heads of the railway service from their own proper business of managing their railway, is a separate question. But, at least, it is something to have substituted 35 for 3,000 acts of Parliament. Not that the matter is any too simple even now. It may safely be said that the aid of a trained lawyer will still be necessary to a trader anxious to know whether a rate from London to Swansea or Birmingham is legal or illegal. . . . Unfortunately uniformity could only be obtained by a process which involves a certain amount of leveling up as well as leveling down; and, human nature being what it is, we may expect that, while each case of increase of rate will be cried from the housetops, the much more numerous reductions will be accepted, possibly with gratitude but certainly in silence. It is to be hoped, though hardly to be expected, that Parliament and the public will bear this fact in mind when the traders' conferences and chambers of commerce and other similar bodies commence, as they certainly will, soon after Jan. 1, to pass resolutions of indignant protest, for this rates controversy has already lasted much too long, and almost any settlement of it is better than none. Even if the traders' ideal were attained, and the new revised rates contained reductions only, without a single increase, we should not satisfy everybody, as it is at least conceivable that some among the railway shareholders of the country might be unreasonable enough to object. And, after all, the railway shareholders have some claim to consideration, for not only do they number something like 300,000 persons, very many of them defenceless women and children, but also, had it not been for their investment of £900,000,000 of capital, there would have been no railway rates at all for the traders to revise.

*Extracts from an article by Mr. W. M. Acworth in the London *Times*.

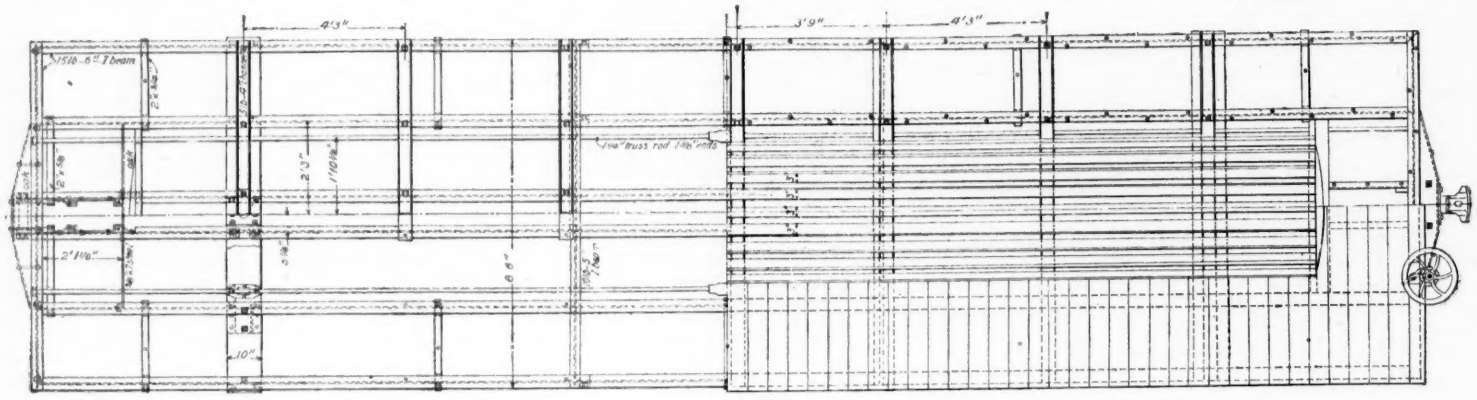
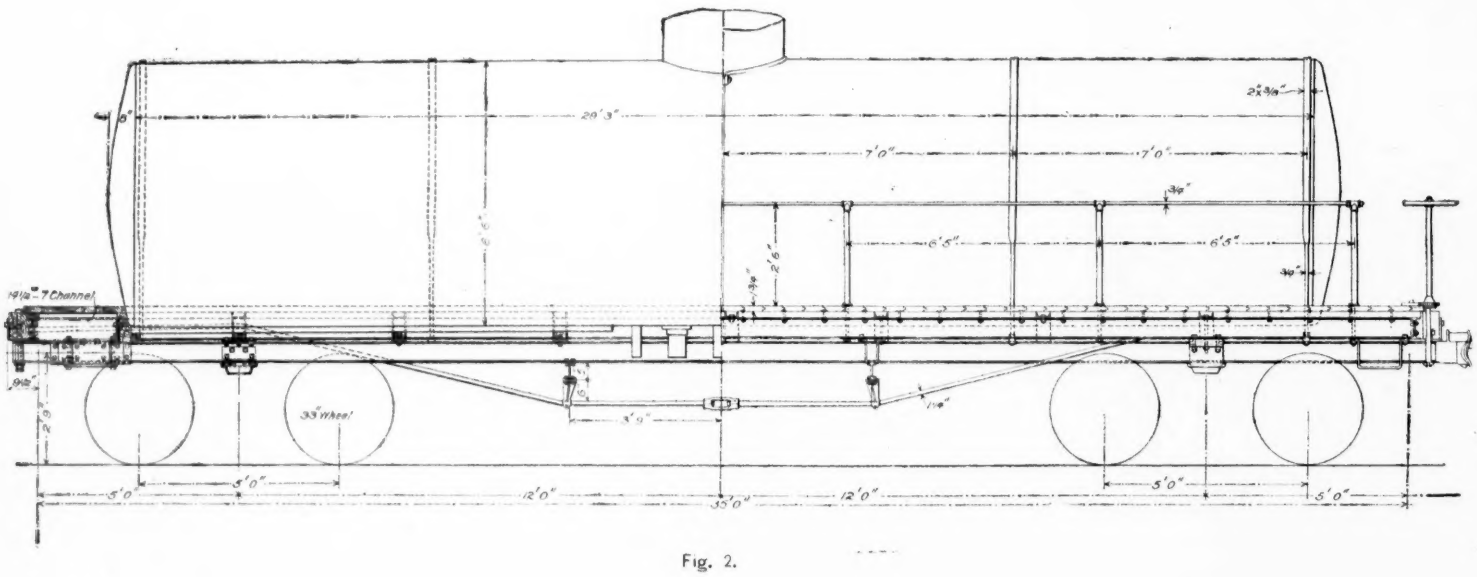


Fig 1.



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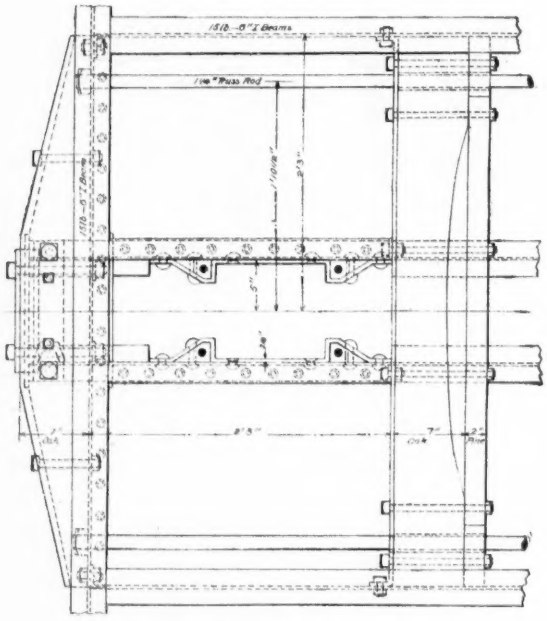


Fig. 6—Plan of End Sill and Head Block.

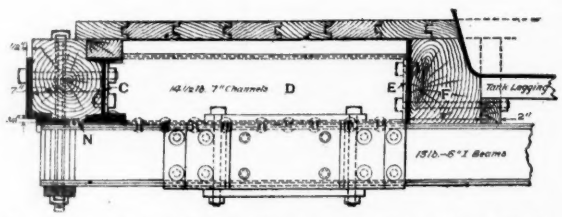


Fig. 5—Longitudinal Section Showing End Sill and Head Block.

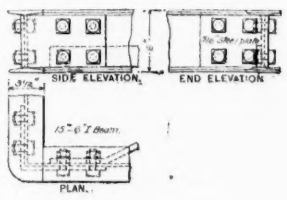


Fig. 7.

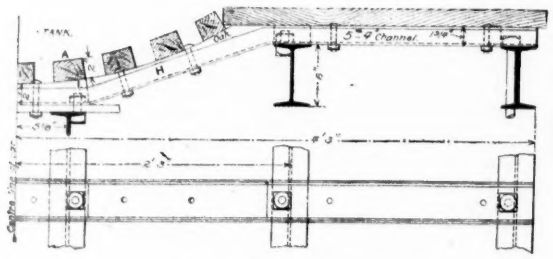


Fig. 4—Tank Saddle

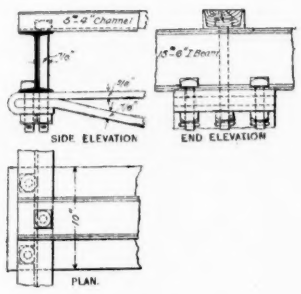
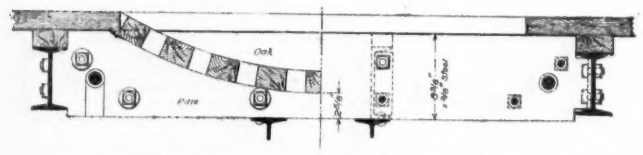


Fig. 8.



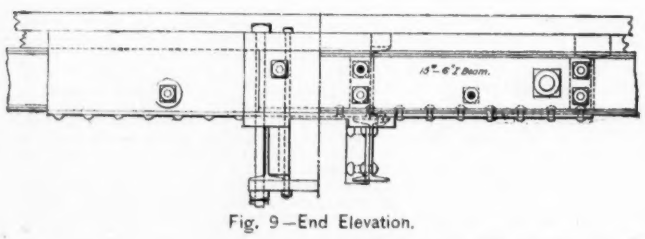


Fig. 9—End Elevation.

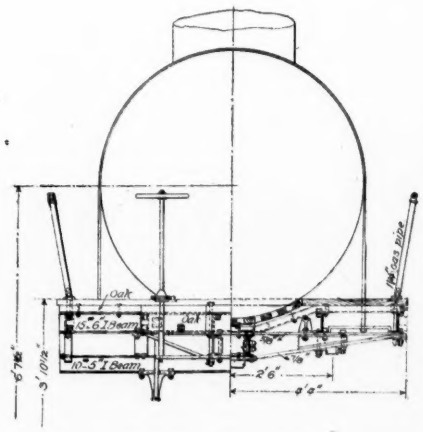


Fig. 3—Half Elevation and Section.

TANK CAR WITH STEEL UNDERFRAME.

Designed and Built by the HARVEY STEEL CAR & REPAIR WORKS, *Chicago, Ill.*

The Harvey Steel Underframe for Tank Cars.

The Harvey Steel Car & Repair Works (formerly the Harvey Steel Car Co.), at Harvey, Ill., have brought out a new steel underframe for tank cars for the Standard Oil Co. This is shown in detail by the accompanying illustrations. The Harvey company has been developng during the past six months a tank car frame, based on their experience and observation of the Standard Oil Co.'s cars, a large number of which they repair. Mr. J. D. McIlwain, a member of the committee appointed by the Master Car Builders' Association to report on the value of steel centre sills for cars, and superintendent of the works, is the authority of these designs.

Fig. 1 is the side elevation and shows how the tank is carried on bent channel irons filled with hard wood, and

which extend across the frames, also shown in the plan, fig. 2. In fig. 1 is also shown as well the method of attaching the draft, near the buffer block, and the end stops for the tanks. This end is an important departure as it is arranged to take the thrusts directly from the tank through an oak filling piece between the tank and the channel-iron filling pieces, which reach from the buffer stop to the tank stop. The car sills are formed of I-beams, 6 in. deep, weighing 15 lbs. per foot. The draw bar stops, shown in fig. 2, are of pressed steel. The transoms are 10 in. wide. The bottom plate of the transom is ⅜ thick and the top plate ⅝ thick. The section, fig. 3, shows how the tank is held to the frame by means of straps passing over the top and secured to a wrought iron bracket below the I-beams.

The details of construction of this very interesting design are shown in figs. 4 to 9 as follows:

Fig. 4 is a detailed section through one of the tank carriers. The tank rests on the longitudinal carriers *H*, made of oak, which are secured to the oak filling pieces *I* in the transverse channel. These channels are secured to the I-beams by bolts, as shown. The running board is nailed to the filling pieces in the transverse channel.

Fig. 5 gives a detail of the tank end-stop. An oak filling piece *F* is placed between the end of the tank and the cross-plate *E*. The cross-plate is secured to the short channels *D*, which extend to the I-beam and sill *C*. The buffer block against which the stop on the draw head strikes is placed outside of the end sill and is protected by an angle iron, as shown. To prevent driving the end sill inward a plate *N* is riveted to the centre sills with the lip turned down on the outer end of the end sills and another lip turned upward just inside of the end sill. The draw bar stops are riveted to the centre sills, as shown. These details are shown in plan fig. 6.

Fig. 7 gives the construction of the corner of the frame at the joint between the end sill and the side sills. At this point there is a strap on the outside of the joint which is secured to the side sill and end sill by four bolts in each end of the strap.

Fig. 8 shows the method of securing the transverse channels and the transom to the side sills. This connection is made by vertical bolts, as shown.

Fig. 9 gives in detail a section through the frame at the tank buffer block and shows the draw bar support and the plate back of the tank buffer stop.

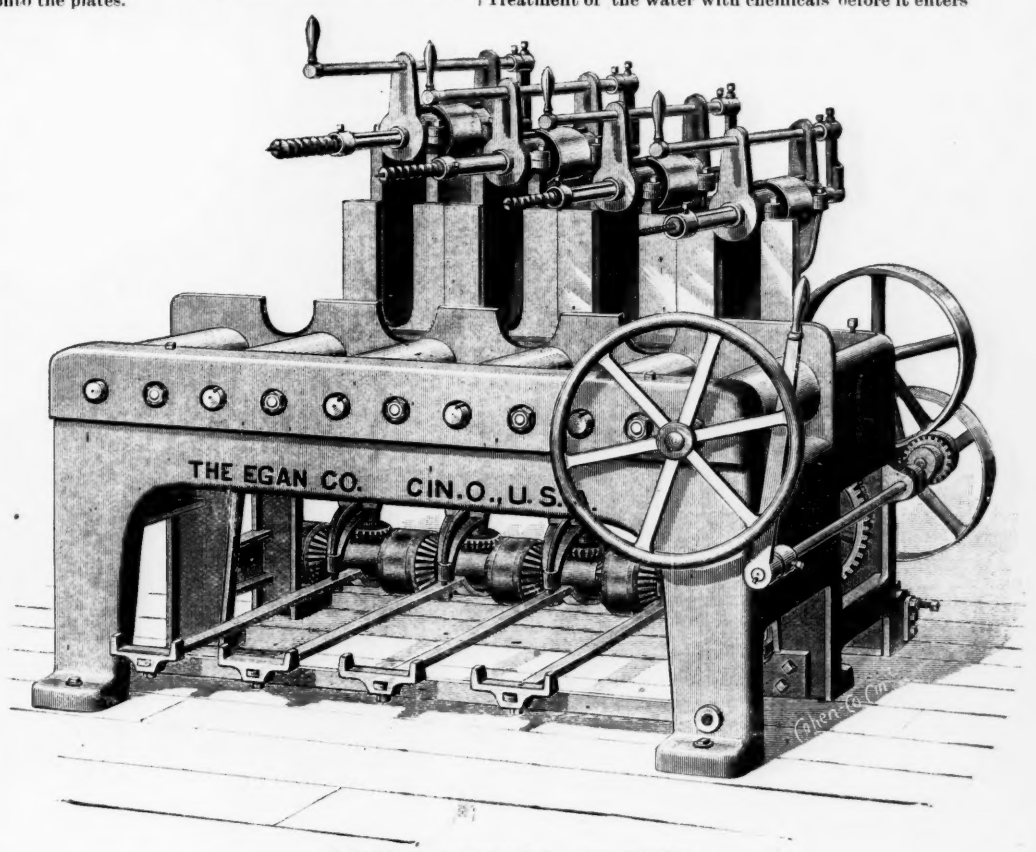
Most of the joints in the framing are riveted together, and the construction on the whole is the best yet brought out for steel underframes. More particularly is it deserving of praise for tank cars. This design is worth the attention of all who are in any way interested in the use of steel for car construction as it is a decided advance in many respects over cars previously constructed with metal underframes.

A considerable number of these cars are now being built by the Harvey company for the Standard Oil Co., and judging from the class of repairs usually required on tank cars it seems quite probable that cars of this design will cost much less for maintenance than the wooden cars commonly used.

Multiple, Horizontal Car Borer, with Power Feed Rolls and Elevating Spindle.

The engraving shows a new, multiple, horizontal borer, which is a powerful and useful machine for rapid and heavy boring. It is especially adapted for car and bridge work. The column is one heavy casting planed true for the mandrel frames to rise and lower, and holds them rigid. Each mandrel frame is raised and lowered by a combination of gears and friction operated independently by foot power. The roller frame is large and heavy, and carries six feed rolls driven by power in either direction, or by hand, at the will of the operator. The spindles are of steel of large diameter, brought to the work by hand, and stops are provided for gauging the depth of boring.

The machine is of great capacity. Holes can be bored as close as 9 in., and 16 in. deep, and each spindle will rise 14 in. above the table. The tight and loose pulleys are 18 × 5½ in., making 450 revolutions per minute. The makers are the Egan Co., Cincinnati.



MULTIPLE HORIZONTAL CAR BORER.

Feed Waters and Boiler Incrustation.*

The question of incrustation is to a very large extent a chemical one, though it also has its mechanical side; but it is to the former aspect that I propose to give my attention, suggesting that a paper devoted to the mechanical portion of the subject, from an engineering member of the institute, would be of great interest and utility. A careful investigation of the increased consumption of fuel resulting from various thicknesses of scale is greatly needed, as there are some very extravagant statements made on the subject; one experimenter stating that the fuel consumption is increased 150 per cent. by incrustation ⅛ in. in thickness. We are accustomed to divide water into two classes—soft waters containing relatively small quantities of lime and magnesia salts in solution, and hard waters containing relatively large quantities of these salts in solution. The substances most commonly found in natural waters are carbonate of lime, carbonate of magnesia, sulphate of lime and silica.

The above substances when present in quantity readily form scale, while the substances given below, owing to their great solubility, rarely form scale, though it will be noted further on that some of them by decomposition very often aid in forming incrustation: Chloride of sodium, potassium, calcium and magnesium; sulphates of sodium, magnesium, potassium; nitrates of sodium, calcium and magnesium.

Let us consider in detail the various salts mentioned above. Carbonate of lime is most abundant in nature, and is found in nearly all natural waters, either in traces or in quantity. Carbonate of lime itself is soluble in water only to the extent of two or three grains per gallon, and this solubility rapidly decreases as the temperature rises; but when the water also contains carbonic acid in solution, the solubility of the lime salt is enormously increased, and as much as 85 grains per gallon may be dissolved. The bicarbonate of lime thus produced constitutes the temporary hardness of water so called, because, on boiling, the carbonic acid is expelled and the carbonate of lime is deposited. Hence a water of this class can be partially softened by boiling. The precipitation of the carbonate of lime commences at a temperature of about 150 deg. Fahr., and is complete according to M. Couste, at a temperature of 290 deg. Fahr. This is at a working pressure of about 60 lbs. Where there is little sulphate of lime present in the water, in addition to carbonate of lime, the incrustation resulting from the latter salt may be reduced to a minimum by the judicious use of the blow-off cock, as the carbonate of lime falls as a soft sludge, which remains soft for a considerable period and may therefore be blown out. Many of the carbonate of lime scales are produced by emptying the boiler while the plates and brickwork are hot and the self-sludge is thus baked onto the plates.

Carbonate of magnesia, like carbonate of lime, produces temporary hardness, being held in solution by carbonic acid. On boiling, the carbonic acid is expelled, and carbonate of magnesia is deposited. Unlike carbonate of lime the decomposition may proceed further, carbonic acid again being expelled, and magnesium hydrate resulting, which, acording to Paul, acts as a powerful cement on any sulphate of lime that may be deposited. A sulphate of lime scale bound together by magnesium hydrate is exceedingly difficult to remove from the boiler plates. Calcium sulphate is undoubtedly the *bête noir* of all anti-incrustators, and gives endless trouble when present in the feed water of a boiler working at a high pressure, in quantity.

Calcium sulphate occurs in nature as gypsum—that is, sulphate of lime combined with two molecules of water—and, unlike carbonate of lime, is dissolved by water without the aid of carbonic acid to a considerable extent. The solubility depends upon the temperature of the water, the maximum point of solubility being 95 deg. Fahr. when 178 grains per gallon are dissolved. As the temperature rises the solution diminishes, until at 212 deg. Fahr. only 150 grains per gallon are dissolved. If boilers were worked at the ordinary atmospheric pressure or low pressures, with this comparatively high solubility, even with bad waters, it would be possible, by an intelligent use of the blow-off cock, to keep the plates free from scale, as the saturation of the water by the gypsum might be delayed for a long time.

Gypsum retains its two molecules of water at a temperature of 212 deg. Fahr., but when the temperature rises to 260 deg. Fahr., corresponding to a pressure of about 35½ lbs. to the square inch, it begins to lose this water, and at 303 deg. Fahr., corresponding to a pressure of about 70 lbs. per square inch, is converted into anhydrous sulphate of lime, which is practically insoluble in water. The disposition of sulphate of lime is therefore due to the loss of the two molecules of water, the precipitation commencing at about 260 deg. Fahr., and being complete at about 303 deg. Fahr. The anhydrous salt, along with magnesia and the other formers, rapidly sets into a hard scale, which is no doubt familiar to all of you.

Alkaline waters, owing their alkalinity to carbonate of soda, are occasionally met with as natural waters, and are very objectionable for use in the boiler. It is to be observed that these waters frequently contain carbonate and sulphates of lime, and at the same time carbonate of sodium. This state of things can only exist for a time, for immediately the water is heated a reaction takes place by which the lime salts are precipitated.

A concentrated solution of carbonate of soda rapidly attacks boiler fittings. The small amount of copper dissolved from the latter in contact with the iron plates is, in its turn, precipitated, an equivalent quantity of iron passing into solution. With concentrated alkaline waters a series of reactions may thus be set up, which will rapidly produce pitting of the plates. The last form of deposit to which I shall allude before considering the various methods used for softening water, is a dangerous form of incrustation, which has followed the introduction of high pressure steam.

The fatty acids and unsaponified oils present in the incrustations are derived from the oils used to lubricate the cylinder of the engine, and are communicated to the feed water, when the exhaust steam from a non-condensing engine is used to heat the feed, or the feed is drawn from the hot well of a condensing engine.

We have now considered the most important mineral constituents of natural waters and also other substances rendering the water unsuitable for the purpose of raising steam. We have noted the wide variation that may occur, both as regards the kind and quantity of mineral water in solution. It follows from these variations that no one specific can be efficacious with all waters as a preventive of incrustation. The attempt to obtain such a substance will be as successful as were the efforts of the old alchemists to discover the principle that was to transmute the base metals into the noble ones.

The treatment to which boiler waters are subjected to prevent scale may be divided into two classes: (1) Treatment of the water with chemicals before it enters the boiler; (2) The introduction of chemicals into the boiler itself. Without doubt, wherever financial considerations will allow, treatment of the water by the first plan is always to be preferred, as it allows of the careful adjustment of the chemical added, and the precipitated salts do not enter the boiler at all. Numerous companies are adopting this plan at the present time in preference to the use of compositions, and it is evident from the number of firms making a specialty of water treatment that precipitation outside of the boiler is gaining ground.

The oldest process for the softening of water is Clark's, and is applicable, as originally introduced, to waters owing their hardness to carbonate of lime and carbonate of magnesia. As we have already noticed these salts are held in solution by dissolving carbonic acid, and if we can drive out or absorb the carbonic acid the carbonates are precipitated, not entirely, but with the exception of two or three grains per gallon. Clark's process consists in the addition of sufficient lime, preferably in the form of limewater, to combine with the carbonic acid and so form insoluble carbonate of lime. According to Dr. Frankland, to soften 700 gallons of bicarbonate water for this process, one ounce of quicklime is required for each part of the temporary hardness in 100,000 parts of the water; that is, a water containing 15 grains of carbonate of lime per gallon would require 21.1 ozs. of lime for every 700 gallons in order to soften it, or 30.1 per 1,000 gallons.

Where waters owe their hardness to both carbonate and sulphate of lime the solution of limewater is not infrequently mixed with caustic soda or carbonate of soda, the proportions of these substances depending on the quantity and relative proportions of the incrusting salts. Sodium hydroxide may with advantage be used alone where the amount of bicarbonate of lime is present in quantities equivalent to the amount of sulphate of lime; that is, in the proportion of 144 parts of bicarbonate to 136 parts of sulphate. Other reagents besides caustic soda, caustic lime and carbonate of soda have been proposed for the softening of water, notably phosphate of soda and chloride of barium. But, chiefly on account of their cost, they have not come into general use like the first mentioned substances.

We now come to consider the prevention and reduction of scale by the far more generally adopted plan of passing some chemical, either directly into the boiler at the commencement of a working week, or continuously along with the feed. The latter plan is infinitely to be preferred wherever possible, particularly if the chemical and feed pass through the heater, the softening of the

* Abstract of a paper read by Mr. Harry Silvester before the South Staffordshire Institute of Iron and Steel Works Managers.

water then taking place to a certain extent outsio boiler, large quantities of the precipitated salts remaining in the heater. The practice of adding to the boiler at the commencement of the week what is judged to be sufficient composition for several days is not to be recommended, causing, in the case of caustic composition, the boiler to "kick" and also the fittings to be attacked and corroded by the alkali. This custom might be paralleled in ordinary life by a man taking his breakfast, dinner, tea and supper at a sitting. Such a practice would certainly save time and trouble.

There are innumerable substances in the market as boiler compositions, the following being by no means a complete list of the substances which form the basis of these concoctions, or have been recommended for use: Caustic soda, soda ash, phosphate of soda, silicate of soda, tannate of soda, fluoride of sodium, chloride of ammonia, sulphate of soda, potatoes, starch, dextrine, molasses, sugar, tannic acid, barks, sumac, gelatine, etc.

The above substances roughly fall into three divisions, according to the manner in which they act, as regards the prevention of scale: (1) Those substances which aim at precipitating the incrusting salts from the water, in such form that they may be blown out of the boiler by a judicious use of the blow-off cock. To this class belong the inorganic compounds such as the salts of sodium. (2) Those substances which have a mechanical action, rather than a chemical one, preventing the precipitated salts from uniting into a hard mass. To this class potatoes, dextrine, starch, etc., may be assigned. (3) Those substances which, when added to the water, increase the solubility of the incrusting salts, and thus either entirely or partially prevent their deposition. To this class may be assigned gelatin and also sugar, which, with lime salts, forms soluble saccharate of lime. Of course these divisions are not hard and fast ones, for substances classed as merely mechanical no doubt react chemically as well, while the gelatin and sugar act mechanically in preventing the hardening of any deposit that may form. In practice it is usual to mix the precipitating salts with some form of organic matter, no doubt in some cases with the two-fold object of disguising the weakness of the solution, and also preventing the adhesion and cohesion of the precipitating salts, and where the organic matter is harmless, such an addition for the latter purpose is decidedly to be recommended.

Caustic soda or carbonate of soda, along with some form of organic matter, enters very largely into the majority of compositions on the market. The use of these substances with carbonate waters is not to be recommended, as the alkali, after doing its work, still remains in the water, and, if allowed to become concentrated, causes priming, and also attacks the fittings, setting up a series of reactions, to which allusion has already been made. Where sulphate of lime is also present in the water, in quantities in excess of the carbonate, then soda ash is, no doubt, a most useful composition, as the carbonate of soda remaining in solution throws down insoluble carbonate of lime, sulphate of soda going into solution. It is generally advisable to have organic matter present in the composition to mechanically prevent the precipitated carbonate from cohering and adhering. With acid waters, carbonate of soda gives excellent results when added in suitable proportions.

Silicate of soda, or soluble glass, is not unfrequently used as a scale preventive, its action being the precipitation of the lime and magnesia as silicates. Mr. Paul states that in certain cases the precipitate sets hard, but the use of organic matter along with it would, I believe, effectually prevent this. Of course, excess must be carefully guarded against.

Tannate of soda is highly recommended as a boiler composition, its action being the precipitation of the lime as tannate of lime. This separates as a loose deposit, which does not adhere to the plates, and can, therefore be blown out. Tannic acid, uncombined with soda, has been used, but it is found to have an action on the plates, and therefore is not to be recommended. The cost of tannate of soda constitutes the difficulty of bringing it into general use, and many of the so-called tannate of soda compositions are merely exhausted tan—that is, tan from which the tannin has been extracted, boiled with soda.

Such substance as catechu, nut galls, oak barks, sumac, logwood, contain tannic acid, and owe their value as anti-incrustators to this substance, which acts chemically, and in a less degree to other extractive organic matter, which acts mechanically.

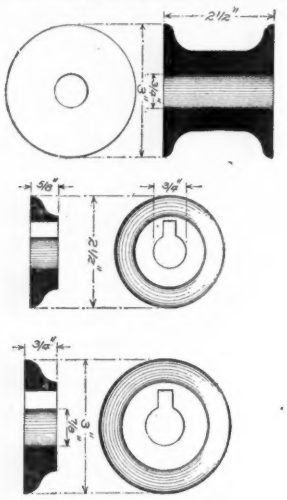
Sodium fluoride is given by Professor Lewes as being highly efficient for the prevention of incrustation. Among its advantages may be mentioned a very low combining weight, and the rapidity and completeness with which the lime and magnesia salts are precipitated, the precipitate showing no tendency to harden. Like several other very valuable scale preventives, its cost renders the extensive application of it too great a luxury. There appears, however, to be prospects of this being sufficiently reduced to bring it into practical use.

Potatoes, dextrine, starch, etc., are frequently used in boilers, with or without soda. They form a slimy deposit on the precipitated salts, thus preventing their setting into a hard scale. It has already been noted that sugary matter owes its efficiency as an anti-incrustator to the formation of soluble saccharate of lime with the incrustating salts, thus preventing their deposition.

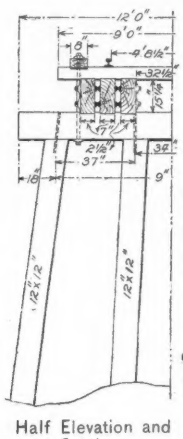
Gelatin also acts by retaining the sulphate of lime contained in the water, in solution, that substance being more soluble in a water containing gelatin. It is said by Mr. Paul to give good results with a carbonate water, containing at the same time a small amount of sulphate of lime. On heating the water, carbonate of lime is precipitated along with some gelatinous matter, the sulphate of lime being retained in solution, and thus the hardening of the carbonate precipitate is prevented.

In many quarters compositions are in bad odor, and are regarded as doing no good, or positively more harm than good. That such is very often the case is beyond doubt, because one composition is recommended for every class of water, and we have seen how unsuitable some chemicals are for particular waters—*e. g.* caustic soda for carbonate waters. Another fruitful source of failure is the inadequacy of the quantity of chemical used to deal with the amount of mineral matter existing in the water. The fact is, the price charged for most compositions renders their application in anything like practical quantities far too expensive a process and a thorough revision of charges is sadly needed. One hundred and six grains of carbonate of soda will precipitate the lime of 136 grains of sulphate of lime, and the quantity of solution used should be calculated on reactions of this kind, together with a knowledge of the amount of feed required per hour for the boiler. Directions as to the quantity to be used of composition based on the horse power are very often issued with the concoctions, and are practically valueless, as the mineral matter to be precipitated varies widely with different waters, and of this such directions take no account.

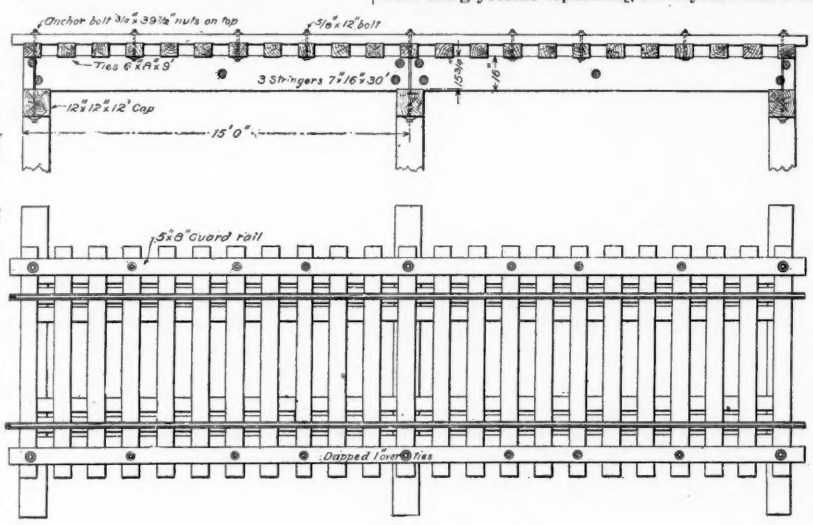
The use of chemicals in the boiler, where they are exactly suited to the water, in kind and quantity, is but an imperfect remedy, and it is certain that the empirical application of compositions can rarely be beneficial, but, on the contrary, may intensify the evils that their addition is intended to minimize.



Packing Spool and Washers.



Half Elevation and Section.



Plan and Side Elevation.

STANDARD TRESTLE—SOUTHERN PACIFIC—ATLANTIC SYSTEM.

(No descriptive text is thought necessary with the above engravings.)

The Leland Low Pressure Steam Heating System.*

The Leland Car Heater Co., of New York, have recently introduced a system of low pressure steam heating for railroad cars which they claim assures comfort and is perfectly safe should a pipe break.

The heating pipes in the low pressure system of a large passenger coach contain about 30 gallons of steam which, at five pounds pressure, contain but one-fifth of a pint of water at a temperature of 227 deg. Fahr. In the Leland low pressure system, the secondary boiler and its pipe connections are placed beneath the car floor, and require but three gallons of water. As the steam pressure is raised in the car heating pipes to five pounds, the generating surface in the boiler becomes uncovered by the evaporation and entrailment of the water in the heating pipes, and is made inert beyond the condensing capacity of the radiator pipes to return the condensed water to the boiler. There being but a single pipe boiler connection for each end of the car, the water returning by the same pipe that the steam flows through, there is no possibility of the boiling water being precipitated into the car by a break in a heating pipe, and only a few pints of water can be turned into steam if the steam from the locomotive should be continued in the generator after a break.

The steam flows to each end of the car from a central generator. It is claimed that the car is thus equally heated at each end and complete circulation through all the heating pipes secured in five minutes after turning on the steam valve at the locomotive.

The steam generator is a brass cylinder filled with small copper tubes and is placed within a wrought iron pipe cylinder but little larger in diameter and only long enough for circulation of water through the tubes of the generator, thus making the body of water between the generator and its case bear a certain relation to the volume of steam required in the radiating pipes for an assumed pressure.

At 5 lbs. pressure 7 cu. in. of water will be evaporated to fill the heating space in the radiating pipes, connections and boiler, while at the estimated rate of 800 heat units per minute for the radiation and connection of the system, one pound of water (25 cu. in.) will be condensed per minute. As the water returns slowly through the horizontal pipes, about 40 cu. in. will be on its way back to the boiler, which with the 7 cu. in. steam is 47 cu. in. taken from the boiler. This so lowers the water level that a portion of the generator shell and one or two of the rows of tubes become uncovered, and reduce the steam-making power of the generator, limiting the pressure in the radiating pipes and balancing the generating and generated forces.

The boiler and inclosed heater is neatly covered with felt, and boxed for increased efficiency, and to guard against freezing of the small quantity of water in the apparatus, which in its present form allows all the water to return within the cylinder, leaving no water to freeze in the pipes. As an additional 10 per cent. of safeguard against freezing when the car is not in use, glycerine may be mixed with the water in the boiler, which reduces the freezing point of the mixture below that of water and increases the boiling point to 214 deg. Fahr. With this proportion of glycerine the mixture does not freeze solid like pure water, but becomes acidulated, with the glycerine separating the crystals like a mass of snow and water, so that at a temperature of 16 deg. Fahr. the mass can be stirred like molasses. As the glycerine does not evaporate by the generation of low pressure steam, and as the water performs a cycle in the operation of heating a car by returning to the boiler, there is no waste of the glycerine and only a small waste of water by the air valves and possible leakages in the steam coils, so that when once charged water only is required for supplying the small waste.

* Illustrations of the Leland heater as applied in conjunction with the Baker heater on the New York, New Haven & Hartford appeared in the *Railroad Gazette* Sept. 11, 1891.

Annual Report of Kansas Railroad Commissioners.

The railroad commissioners of Kansas, Albert R. Greene, W. M. Mitchell and George T. Anthony have issued advance sheets of the 10th annual report of the Board, for the year ending Dec. 1. The length of railroad in the state is 8,886 miles of which 11½ miles is not operated. This total is less than shown in the previous report, owing to an error last year. The report shows:

	Killed.	Injured.
Employes	242	1,176
Passengers	38	188
Others	311	258
Total	591	1,622

The statistics of traffic receipts, etc., evidently show totals which include a good deal of road outside of Kansas, and are therefore of no special value in this place. The Commissioners state that every distinctively Kansas road, except two short branches of the Union Pacific, shows a deficit. The distinctively Kansas roads show, however, large increases in freight tonnage. It is stated that the number of freight cars per train, both loaded and empty, remains about the same as was shown by the last previous report, but the average train load of merchandise has nearly doubled, being 168 tons during the past year as compared with 85 tons in 1890. The number of employés in Kansas is 27,225, an increase of about 10 per cent. A number of tables are printed showing the reduction in freight rates, comparisons being made between 1883 and 1892. This reduction, which is very large, has some of it, been due to competition among

the roads, "but more to supervision and regulation under the Commissioner law."

The "wholesale grocers' case" is still pending in the State Supreme Court. The Board complains that the injunction against the use of the reduced rates, which were ordered by the commissioners in this case was issued by a district judge without waiting to see whether the roads refused to comply. Several pages of the report are devoted to the action of the railroad commissioners in distributing relief to the distressed settlers in Western Kansas two years ago. It appears that the main part of this work was done by the commissioners, and under their direction, and they summarize the money value of the aid, so far as it went through their hands. The state and citizens contributed $78,000, and the railroads furnished $20,000 in freight and $1,500 in passenger transportation.

The Trade of Buffalo.

Buffalo papers of Dec. 31 contain a triumph in the way of prompt statistics. The total receipts of 179,309,500 bushels of grain and flour reduced to grain are 16,917,910 bushels more than the receipts of last year and some 60,000,000 more bushels than in 1890. The marine arrivals and clearings from the port were 11,497 vessels and 9,560,942 net registered tons.

Statistics of the receipts of grain, and flour reduced to grain, have been kept at Buffalo from 1836, when the total was slightly less than 1,250,000 bushels, to the present time. The grand total is 2,851,239,494 bushels.

The following table shows the average rates, and highest and lowest rates in cents per bushel, for wheat from Chicago to Buffalo during the last 10 seasons:

	Highest.	Lowest.	Average.
1892	3.0	1.0	2.2
1891	4.5	1.0	2.4
1890	2.5	1.5	1.9
1889	4.2	2.0	2.5
1888	3.3	1.7	2.5
1887	6.0	3.0	4.1
1886	5.2	2.0	3.6
1885	3.3	1.0	2.0
1884	3.0	1.7	2.1
1883	5.2	2.2	3.4

The rates per bushel from Buffalo to New York on the Erie Canal for the ten years have been as below:

	Highest.	Lowest.	Averages.
1892	6.0	2.0	3.5
1891	4.7	2.5	3.5
1890	4.2	3.0	3.8
1889	5.0	3.7	4.8
1888	4.5	1.9	3.4
1887	7.0	3.5	4.6
1886	6.5	3.0	5.0
1885	6.0	3.0	3.8
1884	5.5	3.2	4.2
1883	6.5	3.5	4.9

The through rates, New York by canal to Buffalo and by propeller to Chicago or Milwaukee, have been in cents per 100 lbs. as below:

1892	1st.	2d.	3d.	4th.	5th.	6th.
Opening to close	30	25	20	18	16	14
1891						
Opening to close	30	25	20	18	16	14
1890						
Opening to Oct. 6	30	25	20	18	16	15
Oct. 6 to close	30	25	20	18	14	12
1889						
May 1 to close	30	25	20	18	16	14
1888						
Opening to July 1	35	30	25	20	18	16
July 1 to close	25	22½	17½	15	14	13
1887						
Opening to close	35	30	25	20	18	16

The following statement shows the receipts of grain in bushels at New York, by routes, during the navigation season of 1892, compared with six previous years:

Receipts by routes, May 1 to Nov. 30, 1892.

	Canal.	Rail.	River and Coast.	Totals.
Wheat	16,566,975	31,840,270	9,709	48,416,954
Corn	3,686,260	9,507,975	6,536	13,200,711
Oats	3,827,400	16,923,500	402	20,751,302
Rye	188,300	740,190	33,994	962,484
Barley	677,900	545,100	238,761	1,461,761
Malt	432,400	2,163,425	54,390	2,650,215
Peas	15,700	265,750	.....	281,450
Total, bushels	25,394,875	61,986,210	343,792	87,724,877
Per cent	28.95	70.66	0.39	100
Season of 1891:				
	30,832,894	63,235,276	77,686	94,145,356
Per cent	32.75	67.17	0.08	100
Season of 1890:				
	30,682,900	31,554,905	212,976	61,850,781
Per cent	48.64	51.62	0.34	100
Season of 1889:				
Grain, bush	33,605,390	26,757,642	412,972	60,776,004
Per cent	55.29	44.03	0.68	100
Season of 1888:				
Grain, bush	33,154,800	23,752,583	1,236,245	53,143,628
Per cent	57.02	40.85	2.13	100
Season of 1887:				
Grain, bush	45,688,100	28,203,162	350,147	74,241,400
Per cent	61.54	37.99	0.47	100
Season of 1886:				
Grain, bush	43,619,355	31,986,766	765,116	76,371,237
Per cent	57.12	41.88	1.00	100
Annual average,				
1886 to 1891	34,669,757	34,700,914	458,005	69,828,696
Per cent	49.65	49.69	0.66	100
1892	25,394,875	61,986,210	343,792	87,724,877
Per cent	28.95	70.66	0.39	100
Increase	.....	34,784,064	.....	27,871,504
Decrease	6,394,755	.....	517,805	.....

From this it will be seen that there has been a decline in both the absolute as well as relative service by the canal.

An Iron Combination.

Rumors are afloat of a great combination of iron makers in the neighborhood of Youngstown, O. It is to include the mills and furnaces of the Brown-Bonnel Iron Co., the Andrews Iron Co. the Briar Hill, Iron & Coal Co., the Mahoning Valley Iron Co., the Ohio Iron & Steel Co., the Andrews & Hitchcock Co. and the mills of the Youngstown Iron & Steel Co., located at Youngstown, Warren and Girard.

An Englishman's Observations on American Signaling.

Last October Mr. John P. O'Donnell, an English signal engineer, now also Consulting Engineer for the National Switch & Signal Co., read a paper before the American Society of Civil Engineers which will be published shortly in the *Transactions*. Mr. O'Donnell gave his opinions of some features of our signal practice and then described at length the signaling of Waterloo Station, London & Southwestern, which we have lately illustrated pretty fully. We give below his remarks on two or three things that he saw in a hasty visit to this country:

With reference to the remark in Colonel Haines' paper [President's address before the Am. Ry. Association] that "the circumstances under which distant signals should be required will affect the rules for operating a block system as well as the essential requisites for the proper appliances," it would seem to the writer to require qualification, as, under every condition of the block system, a distant signal is needed.

The following in Colonel Haines' paper appears also to require explanation, that "railroad managers, civil engineers and inventors are trying to remedy what is called the deficiency in the block system, and it is because the Train Rule Committee is conscious of these facts that it has hesitated to indorse the block system as now used." In England, on such lines as the London, Brighton & South Coast, the London, Chatham & Dover, the Southeastern and other important railways, the union of the lock and block system is carried out, and, with that safeguard, under the absolute block system, it is almost impossible to have rear collisions. The leading idea in American signaling seems to be to eliminate the human agency, but it is submitted that the endeavor to force an automatic system at the present moment is untimely. The system will be found to be costly, confusing and unnecessary, as the concentration of points and interlocking them becomes, as it must, more generally adopted. The writer thinks it would be generally agreed that the normal condition of the signal should be the danger condition.

A point which seems to be not yet settled satisfactorily in this country is the question of arranging the signal arms to indicate high speed routes and the various lines traveling either side by side or diverging, as at a junction. The writer had occasion yesterday, through the courtesies of the New York Central officials, to examine the pneumatic plant at Woodlawn Junction, on the Harlem Division of the New York Central & Hudson River. He found that the system appears to be to arrange the top arm always for the important road, irrespective of whether it was right or left. In England our rules are the very reverse, and would appear to me to be supported by simplicity and to be easy of understanding. It would appear to be simpler to take the left-hand top arm for the left-hand road and the right hand top arm for the right hand road, especially when such arms are fixed on separate posts.

The writer also noticed in the same scheme that shunting signals were provided, shunting back on the southbound track in the northbound direction, and he gathers that such provision is usually made in signaling schemes in this country for shunting onto a wrong road. It would appear to be a dangerous precedent to give an engineman absolute authority by signal to shunt in the direction of meeting an approaching train. Our custom in Great Britain is to perform such movements, when needed, by special authority, as we consider that when an engineman has received a definite outside signal to proceed, if he so proceeds, should any accident result through his obeying the signal, he is exempt from responsibility. In your system the risk of running back on the wrong road, the engineman supposing he is on the right and meeting a train from the next section, would appear to be great. We have had many such accidents in England, and the writer notes especially one which occurred in his own experience, at Kingston, on the London & South-Western, where an engineman thought that the crossing points had been removed for him to proceed to the right road; the points themselves had not been moved at all. He proceeded to the next section on the wrong road, met a train coming in the opposite direction, with the result that eight people were killed. No wrong road movements are allowed by signal at any place, to the writer's knowledge, except at Waterloo and one or two other large terminal stations; but at all intermediate through stations corresponding to Woodlawn Junction, no such provision would ever be sanctioned.

TECHNICAL.

Engine and Tender Connections.

The Secretary of the American Railway Master Mechanics' Association has issued the following circular:

Messrs. Barnett, Stevens, Smart, Morris, Hill and Lyne, forming No. 9 Committee on Attachments Between Engine and Tender, ask for prompt reply to the following questions, viz.:

1. With engines coupled to tenders by single stout link and large pins so strong as not to break loose under heaviest pull, have the tank frames any marked tendency to either mount or run under the cab foot-plates? In other words, is there any more risk from the tender frame than there is from the tank leaving frame and sliding into cab?

2. If tender frame has such tendency, can it be prevented? If so, are the probable expense, weight, and work required to prevent it, in your opinion, justified?

3. If not using such a device, are you familiar with any fastening, equipment or invention that is designed to prevent tender frame mounting? If so, will you illustrate or describe it?

4. If in a position to give an opinion as to its practical usefulness, kindly do so.

5. Do you use or recommend safety couplings on each side of the ordinary simple main coupling? If so, should the side safety couplings be single weldless links or short sections of welded chain?

6. Do you use or recommend anything to prevent wear of the chafing surfaces between engine and tender, or make the chafing surfaces of any particular shape, size or metal?

7. What, if any, means do you use to take up the heavy wear that comes on main coupling link, pins and chafing surfaces?

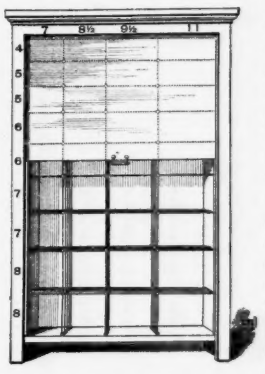
8. If you have used any elaborate connection between engine and tender, did you experience any difficulty in backing up a heavy train (tender first) around a sharp curve, due to flange friction, caused by tender not readily setting to curve?

FOOT-STEPS AND HAND-RAILS,

9. Are long steps safer or more advantageous than short steps having good high flanges to prevent the side movement of foot after foot has once touched the step?

The Acme Wire Shelving.

The illustration shows a cabinet fitted with the wire partition shelving made by the Pope Rack Co., of St. Louis. This device has been on the market for about two years, and has proved very popular. It will be seen that the partitions and shelving are made up of a network of wire fastened to the sides, top and bottom of the cabinet by screw eyes. Turn-buckles are inserted by which the wire can be tightened up as necessary. No. 13 galvanized steel wire is ordinarily used. There are several distinct advantages in this device. It is cheaper, lighter, and is claimed to be more durable than wooden shelving. It can be knocked down and packed in small space for shipping, and this, with its lightness, makes transportation cheaper than that of wooden cabinets. One very decided advantage is that the shelves do not afford lodgment for dust or vermin. This system is applied to filing cases of every sort, the proportions and dimensions of the pigeonholes being capable of any requisite variation. In the case shown the figures on the side show the depths in inches of the compartments, and the figures on the tops their widths. The Pope Co. has a great variety of standard forms of racks and cabinets, open and closed, and will make any special form required. This system has been used with much satisfaction by a good many railroad officers.



The Hancock Inspirator.

The Hancock Inspirator Co., of Boston, Mass., commenced the manufacture of the Hancock inspirator in 1876, at a time when a general prejudice existed against it. During the past sixteen years 200,000 inspirators have been sold, but, until recently no special effort has been made to sell inspirators for locomotive service.

Mr. W. R. Park, the Superintendent of the company, has for the past two or three years been perfecting a locomotive inspirator, and makes the following special claims for this instrument:

1. Reliability under the most trying conditions, such as hot pipes, and hot water in the suction pipe; as it will work with suction water at 120 deg. Fahr. at 100 lbs. steam pressure and below.

2. No adjustment is required for variations in steam pressure from 30 lbs. to 200 lbs., and it will throw a constantly increasing quantity of water up to the latter pressure.

3. A range of 50 per cent. between maximum and minimum delivery. The capacity is reduced by reducing the steam pressure in the lifter chamber only, by means of a valve placed directly under the lever. This arrangemedt does not disturb the suction by creating a vacuum in the pipes, as is the case when it is done by throttling the water, and it does not impair the effectiveness of the forcer.

Simplicity.—All valves are of the ordinary cone type, easily accessible for regrinding, and cannot in this operation be thrown out of adjustment or out of time, as the intermediate overflow valve is automatic. The inspirator is now in use on about sixty roads in different parts of the United States, and will be exhibited in operation for competitive test, at the Columbian Exposition.

The new inspirator will be sent for test and approval at no expense to the road if after a reasonable time it fails to do all that is claimed. It will fit the connections of all the principal injectors in common use without change of pipes.

Dutch Kills Creek Bridge.

A public hearing was held Tuesday in New York before the Harbor Lines Commission, to discuss the application of the Long Island Railroad for permission to change the present two-track drawbridge over Dutch Kills Creek, near Newtown Creek, to a three-track one, at the same time widening the channel between the draws from 32 to 50 ft. There were no weighty objections to the railroad's plan. The minutes of the proceedings will be sent to the Secretary of War, and a favorable decision is expected within a fortnight. If the application is granted, reconstruction will be begun at once, to be ended in June or the beginning of July. The draws will probably be worked by means of an electric motor.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The course of locomotive building still continues downward in quantity, whatever it may be in weight and quality. Singularly enough it is impossible to get complete returns from all the private works, although they are so few. Last year we got returns, from 15 companies, of 2,300 locomotives built; this year 13 companies report 1,882. As three works reporting in 1891 do not report in 1892, and one works reporting in 1892 did not report in 1891, these figures are not comparable. But we have returns from 12 companies in both years. These report 1,963 locomotives built in 1891, and 1,703 in 1892. Of these, five increased their output by 67 and seven decreased by 327. There are no obvious reasons why some shops should have gained while others lost; the gains and losses were distributed among small and large shops alike. In 1891 13 works built 2,153 locomotives, against 2,240 built by the same works in 1890. In 1891 10 out of the 13 shops reported a diminished output. The year 1890 seems to have been the year of maximum product up to date. A comparison on a tonnage basis would be very interesting, but we have no data for that.

The car builders seem to have had better luck last year than the locomotive builders. At the end of 1891 we reported 95,514 freight cars built by 50 private companies. This year we have 93,293 built by 48 companies. Probably if we had returns from the same number of companies this year the total output would be shown to be greater, for 42 companies reporting in both years built 77,629 freight cars in 1891 and 90,340 in 1892, which, it will be seen, was a very comfortable increase. The same companies built 1,636 passenger cars in 1891 and 3,795 in 1892. Of the 42 companies reporting in both years 16 show a decrease of 6,084 cars. It is probable from these figures that the output in each of the two last years was actually below that of 1890, when we were able to report 103,774 freight cars built outside of the railroad companies' shops. These returns of freight cars built and the returns of locomotives given in the paragraph above show that neither the World's Fair nor two years of bountiful crops have been sufficient to make a boom in these industries any more than they have in the steel rail industry; and it is probable that if the car builders had been able to control prices by combination, as the railmakers have done, their output would have been very much less than what we now report. Six of the companies from which we have returns built 4,208 street cars in 1892.

The table published on another page, giving results of tests of the Hawley furnace, is interesting as illustrating the commercial value of different grades of fuel. For example, in the test of Sept. 17 the horsepower developed is the lowest of any test, although it is 25 H. P. above the rated capacity of the boiler; the coal used was of a cheap grade, and the cost of coal per hour per horse power was the lowest, while in the test of Sept. 14, using coal which cost 2.5 as much per ton, 63 per cent. more power was developed at a cost of about twice as much per horse power hour for coal. In other words, if it is not necessary to force a boiler the cheap fuel can be used with satisfactory results, but a good coal must be used if forcing is necessary, and there is for each degree of forcing some grade of coal which will cost the least, all considered. This principle is further illustrated by the tests of Sept. 15 and 16, in which the rate of combustion is very nearly the same, but by using the better grade of coal 20 per cent. more power was obtained with an increased expenditure per horse power hour of 23 per cent. Just how far it pays to force boilers is a question of local conditions and the expenditure for coal is, of course, only one factor in the general problem. In any given boiler plant there is an economical combination, which can only be determined by tests such as these, taken in connection with the cost of labor, repairs and depreciation. The price of coal per ton and the cost of coal per unit of power developed are only part of the data necessary to solve the problem. It may be cheaper to force part of a plant and use high priced coal than to employ more men to handle a cheaper grade of coal which requires more boilers for the same output. Similar principles are, of course, applicable in the design of new plants, the first cost of the plant and the value of the space occupied by boilers being also taken into account in that case.

A contemporary states that a steel tire applied to one of the Johnstone double-bogie engines for the Mexican Central burst a few hours after it was put on, flying into several pieces, although it is claimed that the usual allowance had been made for shrinkage. The breakage of a tire secured as usual by a few studs is a very serious matter, especially on a mountain road which runs near the brink of precipitous ravines and over high trestles, and more so as the studs nearly invariably shear off and the tire leaves the wheel, derailing the engine, as a matter of course. This accident, following on the numerous breakages of tires on some engines recently exported to New South Wales, would tend to show that our tiremakers have gone too far in the direction of making tires hard to resist wear, and have not paid sufficient attention to the absolute necessity of giving the steel sufficient ductility and elasticity under strain. Brittle tires may wear well, owing to their excessive hardness, but care should be taken by testing the elongation and tensile strength to make sure that the tire will have sufficient elasticity to resist the blows it receives in running over frogs and bad joints. New tires which break unexpectedly are both expensive and dangerous. It cannot be too often repeated that safe steel of the quality required can only be secured by carefully testing every plate or bar. This axiom, closely followed in most branches of steel manufacture, has apparently been somewhat neglected as regards tires, and it is to be hoped that tire makers and users will heed the warning and regularly and systematically apply physical if not mechanical tests to every batch of tires, the best selection being probably one tire out of every blow, rather than one tire of every 50 as is commonly specified.

Some of the decisions published in our Railroad Law column are of little interest to anybody but lawyers; such decisions concern points which have been decided many times before and now deserve attention only because they show the attitude of the courts on the same subject in different states or on account of some technical point which most railroad officers are obliged to leave unstudied for lack of time. But not all the decisions are of this character; the batch printed this week contains three, the 20th, 21st and 22d, which are suggestive to managers and superintendents. The Supreme Judicial Court of Massachusetts holds, in effect, that a foreman of carpenters is a high and responsible officer; his acts are those of the company itself. He must therefore be a man of the best judgment, with habits of carefulness; and moreover must have ample time to personally inspect the structures under his care. This seems to be the requirement of that decision. The only alternative is to have the chief engineer, or some one with authority equal to his, inspect such structures as passenger platforms often enough to keep the company—that is, the president—assured that reasonable safety is being maintained. The next case is a reminder that mere written warnings do not always fulfill an employer's duty to the employé who does dangerous work. It seems simple to make clearances safe for old and small cars, and to tell the men that a new and large car must be treated as exceptional, as introducing conditions which demand extra care on their part; and it looks fair. But the time comes when the exceptions are more numerous than ordinary cases, and when the burden of looking out for the men's safety falls more upon the company and less upon the men. The courts are quite likely to rein up any company which is dilatory in meeting this responsibility. The third case seems to be one where the suitor was sharp enough to bring forward some very definite evidence of a damaging kind. Carelessness in the construction of track is generally very effective evidence against a railroad before a jury, for the only way to weaken it is to prove that the speed was intelligently and rigidly regulated in accordance with the badness of the track; and that is generally a hard point to prove. One of the best uses of this decision should be to make us "think on our mercies." How many plaintiffs have lost their cases because they did *not* know what a lot of shabby work had been done in tracks, cars and other structures!

Rapid Transit in New York.

The failure to sell the franchise for the proposed rapid transit system in the city of New York was no surprise to us; and the probability that the first relief will come from extensions and improvements of the existing lines of the Manhattan and the New York Central & Hudson River we have long been convinced of. As long ago as November, 1891, the editor of the *Railroad Gazette* said in a public address: "I conclude that it will not pay the private capitalist to build a rapid transit railroad except close to the surface of the ground; that even under the best conditions a fair interest on the cost of construction will be hazardous for some years to come and that the use of electricity as a motive power for such service is still speculative. It follows that the scheme of the commissioners cannot be financed, and that the city will probably have to help build the new system. Meanwhile, it seems obvious that great temporary relief can be had, and that very quickly, by giving to the existing elevated system additional privileges. I know these are unpopular conclusions, but they ought to be considered rationally." Some months earlier we had published some careful and original analyses by Mr. Theodore Cooper and Mr. W. Howard White, which went to show that "the franchise for building a rapid transit railroad in New York, other than by an elevated structure in the street in competition with the present elevated system, is one requiring subsidy, and not one for which capitalists will pay money or which they will undertake without assistance." Again, in last June, we said, "the new rapid transit system will have to compete, for short and long trips, with the very efficient elevated service; for short trips, with various convenient and quick lines of horse cars, and, for short and moderately long trips, with what we may suppose will be the convenient and quick cable line on Broadway." And two weeks later we said, "notwithstanding the opinion of the Commission, we regard it as very doubtful if satisfactory bids will be obtained, but the public will not be satisfied by anything short of an actual effort to finance the project." As the time of offering drew near, there were rumors of "foreign capitalists" interested in the project, and while we have never seen any reason to doubt the correctness of conclusions from many careful considerations of the matter, we could not be so rash as to attempt to predict what "foreign capital" would or would not do, in the light of some of its recent investments in the United States. Therefore, we have recently thought that there was a bare possibility of the sale of the franchise to some group of those persons whom Providence sometimes sends along to help a smart man out of a hole.

But the sale was not made and now comes the next step. What this will be is suggested in the following quotation from a statement given out by Mr. Steinway, President of the Rapid Transit Commission.

"The Commission has by no means exhausted its resources for furnishing the city with rapid transit. It must immediately adopt other means. Its original purpose was to provide lines of transit independent of existing lines, and upon a much broader scale. It has offered the best, the most comprehensive, and, withal, the cheapest system that could be devised. The effort has failed. It must now do the next best thing. . . . The Commission is therefore compelled to devise a plan by elevated structures, which shall provide a sufficient system of rapid transit without too great injury to the streets. These structures might be partly in the streets and partly through the blocks, but if to any great extent through the blocks, the expense of the enterprise will again be found prohibitory. Sufficient and remunerative independent rapid transit railroads can be laid out, both upon the east and west sides of the city, and near the lines of travel most needing them. Such railroads would necessarily be in the streets and avenues not now occupied by elevated structures, but the Commission desire to occupy as few streets as possible. . . . Something must be done quickly to relieve the present pressure and to give renewed impetus to the city's growth in a northerly direction."

It will be seen that so far the Commission has not committed itself to any given scheme of elevated railroad extension, much less to any plan proposed by the Man-

hattan Railway. Nevertheless, it is assumed in the public discussions of the matter, that the Manhattan people will now be called in to help the Commissioners in their effort to solve this most difficult problem; very likely they will be, but we doubt if they bring forward any plan until they are asked to. That the Manhattan elevated can give very prompt, efficient and satisfactory help, there is no doubt. It will probably not be the complete or final solution. Probably the effort will go on until some great system quite independent of the Manhattan is constructed; but nobody can foresee what that system will be or how long New York will have to wait for it. Meanwhile, why should we be stampeded by the old and familiar outcry against the Manhattan elevated? Certainly a scheme of extension of lines, of enlargements of terminals and of additional tracks on the present structures can be worked out that will not be very costly, that will be comparatively unobjectionable and that will be a great relief. The number of trains running over the structures as they exist to-day can be considerably increased by quite inexpensive changes in the present terminals. The number of express trains run and the average speed can be increased by increase of third track, and a great improvement in public accommodation can be made by new lines auxilliary to the present system.

For instance, one of the lines suggested a year or two ago was up West street and Tenth avenue to Fourteenth street and thence to the present lines. But supposing this line was carried right up Tenth avenue to some point toward the north end of the Island, where it could run into the existing west side line; and supposing the present cross line through Fifty-third street were continued to the new Tenth avenue line, the accommodation to the public and the relief of the present congestion would be immediate and great. All of the west side ferries would be served, and much of the crowd taken from the Sixth and Ninth avenue lines, and the congestion of trains at Fifty-third street and Ninth avenue would be at once relieved. At that point 22 trains are now passed in 10 minutes in the busiest times, and that one point sets a limit to the number of express trains that can be run on the west side.

It will be remembered that a recent project was to build a spur track from the Pennsylvania Ferry up Cortlandt street to the Ninth Avenue line. This alone would have been a convenience to a good many people using that ferry, but it would not have relieved the congested lines, and it probably would have added no net revenue to the Manhattan system, for that system now gets pretty nearly as many passengers to and from that ferry as it would get after it had gone to the expense of building the spur and loaded itself with the constant charge of operating it. The difference would have been that the people would not have been obliged to go down and up two flights of stairs and walk several blocks through a crowded street. But the opposition of property owners caused the prompt withdrawal of the plan.

These are merely suggestions of some of the directions in which the Manhattan company can promptly help New York out of its trouble if it is allowed to; but we have no notion of attempting to lay down or even suggest a complete scheme of elevated railroad extensions. The doctors will do that in good time and probably pretty soon. But in calling attention to these obvious ways of prompt relief we wish also to call attention to one fundamental mistake made by a good many of the daily papers in their discussions of this project. That is, in the frequent assertion that no elevated system can give "real rapid transit." In fact just as many trains and just as fast trains can be run on an elevated structure as in a tunnel, and with even greater comfort to the passengers.

The fact is now made apparent to a good many people who have refused heretofore to see it, that New York's best chance of getting present relief in the matter of rapid transit is by giving further privileges to the existing elevated railroads. It is probable that the next great fact that will gradually get itself established is that the complete and comprehensive solution of the New York rapid transit difficulty will be by a new elevated railroad system that can exchange traffic with the lines now in existence, including not only the Manhattan system but the surface railroads entering the city from the north.

The Value of Steam Jackets on Locomotives.

Probably no question in steam engineering has been so generally discussed with so little practical result and so little concurrence of opinion as the economical value of steam jackets. A very complete summary of the opinions of numerous authorities on the steam engine was presented before the American Society of Mechanical Engineers by Professor Thurston at the November meeting in 1890, from which it appears that a majority of investigators has found that some saving was effected by the use of steam jackets, although the amount of the saving varies greatly in different tests. Recently some additional information on the subject has been published through the report of the research committee on the value of the steam jacket to the (English) Institute of Mechanical Engineers, and some light has been thrown upon the question of the amount of jacketing which is advisable by a paper on the tests of the triple expansion engine at the Massachusetts Institute of Technology, which was read by Professor Peabody at the recent meeting of the American Society of Mechanical Engineers.

Former tests have given results which varied greatly and which are in some cases almost contradictory, and those now reported to the Institute of Mechanical Engineers are not much improvement in this respect, as the saving obtained in various tests of different engines varies from 2.5 per cent. in feed water up to 19.0 per cent. The highest results were obtained from a horizontal compound engine which was developing about 113 I. H. P. at 60 revolutions with 50 lbs. boiler pressure and the lowest from a pair of single expansion Corliss engines which were developing about 488 I. H. P. at 65 revolutions with 60 lbs. boiler pressure. The next best result, 18.6 per cent., was from a compound beam, four valve slow speed engine, and the next lowest 4 per cent., from a high speed non-condensing compound.

It seems, however, to be pretty well established that in engines of the same type the value of the jacket increases as the total number of expansions increases; that the saving is less in high speed than in low speed engines; that a greater economy by the use of the jacket may be expected in single expansion than in multiple expansion engines, and that the value of the jacket depends largely upon the local conditions surrounding the engine in regard to the exposure of the cylinders, etc. In general, it may be said that steam jacketing is advantageous whenever the circumstances are such that there is a large amount of cylinder condensation. The practical effect of the jacket is to prevent this condensation to a great extent, and it follows, therefore, that when the steam is initially superheated, little if any improvement can be expected by the addition of steam jackets, and that when the jacketing has been carried far enough to prevent serious loss by condensation, a further extension of the jacket system will be of no advantage and may be a positive disadvantage by the increased loss by condensation in the jackets without corresponding increased efficiency in the cylinders. In Professor Peabody's tests on a triple expansion engine the best results were obtained when all three cylinders were jacketed, but when there were no jackets on the receivers, showing that when all parts were jacketed there was too much additional heat supplied, the practical result being the same as an excessive amount of superheating.

If we apply these arguments to locomotives, we find that we have an engine of high piston speed in which the loss by cylinder condensation might be expected to be comparatively small, but that this advantage is off set by the exposed position of the cylinders on American locomotives. As a matter of fact there is no reason to believe that there is excessive cylinder condensation in single expansion locomotives which are working under reasonably favorable conditions, and therefore the probable saving by steam jacketing or superheating would be so small that the additional complication would not be warranted. On the other hand some compound locomotives have given evidence of a large amount of cylinder condensation, and consequently it is probable that an important economy could be effected by jacketing the cylinders of these engines. If we compare the two and four-cylinder types of compound locomotives it appears that the condensation should be greater in the four-cylinder type, as ordinarily built, for the reasons that the cylinder ratio is larger, and that the steam is therefore expanded under ordinary conditions a greater number of times than in the two-cylinder engines; and that the two-cylinder compound has an advantage on account of the receiver, which connects the two cylinders, being surrounded by hot gas so that the steam may be somewhat dried on its way from the high pressure to the low pressure cylinder. This circumstance presumably reduces the theoretical advantage possessed by the four-cylinder type on account of the large cylinder ratio and greater average expansion.

The conclusion in regard to locomotives which may be drawn is, therefore, that it would not pay to jacket the cylinders of simple locomotives under ordinary conditions, but that it might pay to provide compound locomotives with jacketed cylinders, and that the jackets would give better results on compound locomotives of the four-cylinder type than on those having two cylinders. This is a fortunate condition to a certain extent, because it would be difficult, if not impracticable, to jacket the low-pressure cylinder of a large two-cylinder compound on account of the increased diameter of that cylinder, while on the other hand there would seem to be no practical difficulty in adding jackets to four-cylinder engines, especially as the weight on the truck in some of these engines is no greater than is ordinarily to be found in single-expansion locomotives of similar types.

Judging from Professor Peabody's tests, it might be inferred that jackets on the cylindrical parts of the cylinders of four-cylinder locomotives would be sufficient to prevent excessive condensation, and that it would be inadvisable to attempt to jacket the heads and other exposed portions. The cylindrical walls can be readily jacketed by the use of bushings such as have been commonly used in marine practice, and the resulting complication would be very small. The further essential, the disposal of the water condensed in the jacket, presents some practical difficulties which have hitherto prevented the application of jackets to locomotives, but very possibly these difficulties might be overcome by some form of steam trap, which will lift the water from the bottom of the jacket to the top of the tender tank.

The necessary complication for steam jacketing does not seem, therefore, to be prohibitive, and while we have no data at present from which the conclusion can be drawn with absolute certainty that the saving effected by such a change would be sufficient to warrant its introduction, at the same time the indications of a notable saving are sufficient to call for a careful consideration of the subject. It is evident that the best results by jacketing or superheating would be found on those four-cylinder engines which are intended for slow speed heavy work.

We do not wish to be understood as advocating the universal use of steam jackets on compound locomotives, but the prime object in using compounds at all is to save coal, and in some cases it is worth while to make a strenuous effort to obtain the highest efficiency possible. With this last object in view the lessons which are to be learned by a study of the best marine and stationary practice should not be lost sight of, and that practice certainly points toward the use of steam jackets.

European and American Car Service.

Almost all the car accountants of our older and larger railroads have gone through the same experience in their practice of recording cars. Exactly when reports were first made, and exactly what records the agents at origin and destination of the first cars kept, we do not know, but there seems to be no doubt that the first attempts at consolidating in one office the reports showing the movement of freight cars were based upon the report received from the agents; that is, the first car record was a record of departures and arrivals rather than a record of movement. It might be argued from this that the agent was the first man to make a report, and the conductor's report was a later growth, originating, perhaps, with cutting off of cars short of destination, which would naturally lead to so many inquiries of conductors that a regular report followed as a matter of course. A search in this direction would doubtless be interesting, but hardly of practical value at the present time when all car accountants base their freight record upon the reports received from the conductors, and use the agents' reports as auxiliaries. There are small railroads whose car records are still in the accounting department, and who depend for their record largely on information obtained from the agents, sometimes received in the form of way-bills; but since the Lehigh Valley system went into the hands of the Reading, and the Reading began to keep a complete record of all its coal cars in the office of its Transportation Master, we understand there is no large system which does not enter up the information from its conductors' reports in books or on cards, in order to form a permanent record. Some railroads still check up this information with the reports received from the agents, with the idea of correcting the reports by comparison; but the extraordinary number of records which, it is claimed, are entered and compared by clerks in the offices of these railroads leads one to think that the comparison is largely a superficial one, and the probability is that the reports of the conductors are the ones on which reliance is really placed.

It is obviously quite practicable to enforce the making of a report by every conductor who moves a train; and a comparison of such reports will of course give the complete record of every car moved. On the other hand, as long as there is a siding on a railroad over which no agent has direct authority, it is very difficult to enforce

the making of an arrival and departure report which will cover all points on the road. This is not only the case at out-of-the-way points at which there is absolutely no one in control, but the same thing frequently occurs in large yards where it is impracticable to enforce the making of a report of every arrival and every departure at every point to and from which cars are switched.

It is easy, therefore, to understand how, in the infancy of railroads, when their terminals were small, it was practicable to report arrivals and departures at every point, and a general record might have been kept of such arrivals and receipts which would have been complete and satisfactory; but as the terminals grew and as private sidings were put in, it was quite natural that these arrival and departure reports should become so unsatisfactory that some other resort should have become absolutely necessary.

We have arrived, then, at a point where for movement on their own lines our railroads are depending almost entirely upon reports made by the conductors, and we understand that on some of the larger roads the report of arrivals and departures has been discontinued to a large extent at the more important points. It is interesting to compare this with the fact that on European railroads the entering up of conductors' reports is almost unknown and dependence is placed entirely, or almost entirely, on the reports from the agents. Further inquiry as to European methods would seem to show that this involves a much greater degree of accuracy in agents' reports than is obtained here. This appears to be accomplished by the interchange of receipts between conductors and agents whenever a car is picked up or dropped, and this of course presupposes the presence of an agent at every point where a car can be picked up or dropped, and also his attendance at the time when trains pass. When all this is granted, you have a complete set of agents' reports covering the whole line, and with it a set of reports showing cars in transit which have been checked up between the agents and the conductors. These are probably more nearly correct than are the American conductors' reports. With all this it is possible for the European railroads to make up daily or weekly an absolutely correct balance showing for any given period of time exactly the number of cars at each point on their lines, on foreign railroads and in transit—all this without recording, as American car accountants understand recording, any car movements whatever.

In absolute practice, in an American car accountant's office, when inquiry is made as to the locality of any car, the car accountant can find at once his "last account" in his car record. On the other hand, the European car accountant has nothing to guide him in his search unless the location of the car is given to him at some date and point, as at the point of shipment. When this is given, the European car accountant, with his conductors' and agents' reports, interlocked by their mutual receipts, can trace up the movement of a given car in comparatively short time and find its location; and as in practice no inquiry is made as to a car without some circumstance usually including date and point of shipment and its last load, it is very probable that the foreign car accountant spends less time in hunting up the movement of cars than the American car accountant does in recording them.

The natural inquiry of the American when these foreign systems are detailed is, "But what do you do if you lose a car?" The answer to this is that the European does not lose cars; and his weekly balance, accounting as it does for every car on his line, assures him that no car has been lost. If a car does disappear the amount of work required to find it involves a cost very nearly approaching the worth of the car, but with the constant receipts noted above such losses very seldom occur. We Americans, on the other hand, are always losing cars; but we are finding them again without any great trouble, because our record showing the movement of each car consecutively always gives us the "last account" from which we can start our trace. But although the "finding" of a single car does not cost very much, yet we are called upon to "find" so many that very likely we spend more money in the search than do the foreign railroads in their very infrequent hunts.

It must be remembered, however, that the foreign system, necessitating as it does some agent or other person in charge of every siding, not only along the road, but in yards, presupposes an amount of preparatory work in the making of reports which most of our American railroads could not think of. In the interchange of receipts between conductors and agents, for not only loaded but empty cars, it presupposes a good deal of delay as well as expense which would hardly be countenanced on this side.

The whole comparison would seem to show, therefore, that the car service departments of American and European railroads are no exceptions to the rule that the American prefers a policy which involves less first cost, even at the risk of greater operating expense. He also prefers a machine which will not get out of order, even if some of its parts are not theoretically the best.

The *Northwestern Lumberman* prints an editorial urging lumbermen's associations to establish standing committees on car service for the purpose of keeping lumbermen's claims properly before the railroads. When cars are scarce the lumber dealers are, it is claimed, the first to suffer. A significant paragraph in the article is that "in days when retail yards carried large stocks there was not the necessity for quick deliveries that exists to-day." Orders are now given to the wholesalers as the material is wanted. This incidental remark reveals the root of all the difficulty. Lumber dealers are like other people, and expect that the railroads can maintain cars enough to meet any emergency. The carrier must adjust himself to the circumstances, whether the shipper offers 100 cars in one day, as he does in the busy season, or one car in 100 days, as he does in the dull season. The only practicable course that the railroad can pursue with any show of justice is to treat all shippers alike. Equity is hard enough to maintain even then, for the use of coal cars for lumber, cattle cars for coal and other irregularities will upset the most conscientious plans for fair distribution. The argument of the *Lumberman* seems to be based chiefly on the fact that lumber shippers furnish a large quantity of profitable freight and ought, therefore, to be favored. But this is just the line of argument that legislatures declare to be most vicious. The "public," which makes the noisiest complaints against the railroads is all the time demanding more consideration for the small customer. Coal dealers probably think they have a worse grievance against the railroads than have the lumbermen. The railroads certainly have one against them, for they deal in a necessary of life, and sometimes emphasize their demands for cars by setting up a howl that people are freezing to death. Perhaps the fairest way out of all the difficulties would be for the railroads to disregard all of the claims based on sentiment and distribute cars strictly in proportion to the amount of freight offered. If this resulted in the burning of a few cars of lumber to keep people from freezing it might be accompanied by a general enlightenment which would compensate for the loss.

The annual report of a railroad is often a very blind document, and the "average" stockholder, tackling one of these reports, generally gives up before he begins. He hears that reports are often made for the express purpose of concealing the truth, and he naturally concludes from their report that his own managers are the kind of men that follow that method. There are two common ways of discouraging the inquiring stockholder. One is to make a very brief report, telling him, in effect, that the company's affairs are none of his particular business. The other is to tell him a great many facts, but to leave out those he wants, and to set upside down the most important of those which are shown. The latter is the more common way; but very few men deem it politic to go to the extreme limit of this license, and the requirements of the law often make it hard to do so, and most reports will tell a good deal if they are unraveled in the right way.

It is the individual stockholder's duty to know what his directors are doing, and the *Political Science Quarterly* for December has an admirable article by Thomas L. Greene, of the New York *Evening Post*, on how to go to work to find this out. The title of the article is Railway Accounting, and, taking an annual report of an imaginary a trunk line railroad (with a non-self-supporting feeder) as an object lesson, Mr. Greene explains with great clearness the relation of the usual items to each other, and the way in which they should be rearranged by the investigator to enable him to grasp the facts with facility. Mr. Greene does not claim to instruct his readers in any sleight-of-hand for discovering things that cannot be learned from a report, and he recognizes the limitations of detail-studying which compel the stockholder to depend in many things upon the character of the directors for his confidence in the property, but he gives a large amount of valuable information nevertheless, and every stockholder who is at all hazy in his ideas about railroad management should read this article. He can learn more about legitimate railroad management than by a hundred conferences with his Wall street agents—unless those agents are far above the average in ability.

A representave of an enterprising firm of ticket scalpers recently called at a *Railroad Gazette* office, and explained the advantages which his firm possessed in the way of utilizing unused transportation furnished by railroad companies in exchange for advertising. He gave the most positive assurance that there was no difficulty whatever on account of such transportation being non-transferable, as his firm never had any difficulty with mileage books or newspaper transportation in any form; and, when it was suggested that this was hardly an honest business, he said that the practice was very general among newspapers. A friend at the editor's elbow suggests that this is a shocking state of affairs, and that general passenger agents ought to be put on their guard against such forgery. We most heartily agree with this view, provided a passenger agent can be found who is not already awake to the situation. The trouble is that passenger agents know too much about these methods already. There would be nothing shocking about the information to them. If non-transferable tickets of a score of the prominent roads were offered to one of these brokers we feel very sure that certain ones among them would be refused by him as unavailable for his uses. And, we are sorry to say, there are others which it is equally certain that a speculator would quickly take, in any quantity, even if he were a person with more or less conscience, for the roads make it so very easy to break the regulations that those who do it actually convince themselves that the practice is proper. Like most other kinds of scalping, this never prospers except where the railroad managers desire to have it prosper.

Two screw ferry boats will be put on about the middle of February to run between the Central of New Jersey station in Jersey City and the foot of Whitehall street in New York. It is expected that these boats will make the trip in about the same time that it is now made to Liberty street. They are to be named the "Easton" and "Mauch Chunk," and will be 158 ft. long, 32 ft. beam, 54 ft. over guards and 14.4 ft. deep. We have known for some time that it has been in contemplation to run boats between the Central of New Jersey station and South Ferry, and the change will be a great convenience for travelers by the Reading and the Baltimore & Ohio systems, as it will enable them to go to and from the elevated railroad under cover. It will be remembered that a proposition was made a short time ago to accomplish a similar purpose for persons traveling by the Pennsylvania by building a branch of the elevated railroad down Cortlandt street to the Pennsylvania ferry there, but this proposition was withdrawn on account of the opposition of property owners. The elevated railroad had little or nothing to gain by it. It was purely for the advantage of the Pennsylvania Railroad and the public. The elevated system would probably not have gained any net revenue, but the public would have gained much in comfort. Probably that proposition will now rest again until it is decided whether or not an elevated line is to be built along the river on West street.

The delay in the progress of the elevated railroads in Philadelphia arising from an injunction seems to be unfortunate, and probably it is merely temporary. So far as one can judge it will impose a financial burden upon the company and will delay the construction of the roads, and will have no other result. The injunction was secured in the Court of Common Pleas and was based upon the ground that these elevated railroads are street passenger railroads and consequently cannot invade the territory already occupied by other corporations of a like character. The Court holds further that if they are not passenger railroads they are railroads within the meaning of the law, and in that case are without legal warrant to occupy the streets. The Master, Mr. C. Stuart Patterson, of the University Law School, dissents from the findings of the Court. He concludes that the charter of the Northeastern Railroad is valid; that it is clearly consistent with the general railroad acts of the state; that it is not a street passenger railroad, but a railroad, and that it is authorized by law to occupy the highways under the franchise granted by the City Councils. The decision of the Court of Common Pleas may be reversed in the Supreme Court, and appeal will probably be taken. If, however, the lower court is sustained, further legislation must be sought, and it will doubtless be secured. Meanwhile the existing street railroads will have a chance to make a little more money, and the public will have to wait a little longer.

The breakage of the shaft of the Umbria has perhaps caused considerably more excitement than the occasion warranted, but this was partly accounted for by the Cunard liners generally making very regular passages, the huge "greyhounds" with their great length and displacement and 12,000 to 20,000 I. H. P. being little affected by weather. On this occasion the Umbria carried the Christmas mail, the largest that ever arrived in New York, no less than 360,000 letters, 160,000 for New York itself, and 200,000 for the rest of North America. The shaft gave way in the thrust bearing, and was repaired by drilling through the collars and binding the parts together by four 5 inch bolts. A crack was discovered a few days out, and as it extended, the engines were stopped and repairs effected before the shaft was really completely fractured. Captains and chief engineers of these gigantic steamers, crossing the stormiest ocean in the world at the highest rate of speed yet attained at sea, have at the best of times an arduous task, and, though Capt. McKay has been criticised, it would appear that a great deal of credit is due to him and Mr. Tomlinson and his staff of engineers for the speedy and the satisfactory manner in which repairs were effected and the ship brought into port in a stormy season.

NEW PUBLICATIONS.

A new railroad journal, to be called *Zeitschrift für den Internationalen Eisenbahn-Transport*, is to be brought out early in 1893, at Berne, Switzerland. It is to be published monthly. There are to be separate French and German editions. Its contents are to be made up of official railroad orders and articles of general railroad interest.

Messrs. John Wiley & Sons announce as in preparation "A Practical Treatise on Foundations," by Mr. William W. Patton.

TRADE CATALOGUES.

The Hall Signal Co., of New York and Chicago, has issued a new and revised catalogue of its automatic block and other electric signals. Instead of issuing one large book, the subject matter is divided into four parts, and there are four separate pamphlets, of uniform size, about 7 by 9½ in. These treat respectively of Block Signaling, Automatic Audible Signals, Electric Interlocking, and Special Electric Signal Protection. The mechanical execution of these catalogues is, if possible, even better than that of the company's former issue, the same artists, Bartlett & Co., New York, being employed. The covers are especially tasteful and elegant in design. The separation of the subjects is a decided convenience and will be appreciated. The most noticeable change in the contents since 1890 is the addition of matter concerning track circuit signals, the Hall Company having now put in a good many signals working by this method. The relative merits and demerits of rail circuit and track circuit signals are set forth with frankness' The arrangement of circuits for wire circuit signals is also explained more fully than in the former issue. The pamphlet devoted to audible signals shows drawings of a piece of road at Michigan City, Ind., where eight crossings, quite near to each other, are equipped with Hall bells, there being only 12 track instruments to actuate all the bells in both directions. The pamphlet on Electric Interlocking shows the arrangement for operating wire circuit block signals on single track. This is illustrated by such applications as that at the Pecos River, referred to in the *Railroad Gazette* of Oct. 28 last. The fourth pamphlet describes station applications, and also shows the Stewart-Hall train order signal.

The Improved McElroy Commingler. Part III. of the general catalogue of the Consolidated Car Heating Co., Albany, N. Y., treats of the McElroy Commingler in its most recent form. The subject is well illustrated and described, and the whole pamphlet is a singularly good example of what a trade catalogue should be.

Improved Air Brake Apparatus. Westinghouse Air Brake Co., Pittsburgh, Pa. The Westinghouse company has issued a catalogue giving illustrations and description of recent changes in certain details of air brake apparatus. The parts shown are the engineer's valve, the pump governor and pressure-retaining valve and the new air pump. All of these were very fully illustrated and described in our issue of Nov. 25, 1892.

TECHNICAL.

Manufacturing and Business.

The copartnership heretofore existing under the firm name of Frank Kiernan & Co., of New York, having expired by limitation, Messrs. Albert Frank and James Rascovar, composing the firm of Albert Frank & Co., have assumed all firm liabilities.

The St. Paul Clay Car Seal Co., the incorporators of which include M. D. Flower, D. D. Merrill, W. G. Denny, Phillip Reilly, Charles J. Haas and J. J. O'Leary, expect to soon commence the manufacture, at South St. Paul, of a patent car seal.

The Foster Engineering Co., of Newark, is getting up a full equipment of their pressure regulators, consisting of 21 valves, for the United States armored cruiser "Columbia," building at the Cramps' shipyards. They have also an order for valves for gunboats Nos. 5 and 6, under construction at the Bath Iron Works, Maine.

H. N. Hovey and J. B. McCracken, of Muskegon, Mich., have purchased what is known as the Muskegon Car Co. plant, which has a capacity of 10 cars a day. It includes about 26 acres of land besides buildings and machinery. The shops are well equipped, but they have been idle for nearly two years, since the failure of the Muskegon Car Co.

Gen. Samuel Thomas, of New York, Senator Calvin S. Brice, and John M. Bass, of Fort Wayne, Ind., have organized a company to build car works and a car wheel foundry at Lenoir City, 20 miles from Knoxville. The car works, it is reported, will have a capacity of 15 cars a day.

The Deitz Passenger Draw-Bar Co. and the Deitz Freight Draw-Bar Co., People's Bank Building, Denver, last week elected the following officers: Edward A. Reser, President; Thomas C. Brainard, Vice-President and General Manager; Henry Deitz, Secretary and Mechanical Expert; Henry B. Adsit, Treasurer.

The Joseph Dixon Crucible Co., of Jersey City, manufacturers of Dixon's "American Graphite" pencils, is putting a fifth story, 175×75 ft., on its pencil factory. The new addition will be equipped with new and improved pencil machinery of the company's invention. Besides this large addition to the pencil factory the company will establish a rubber and brass plant for the manufacture of the various pencil accessories and novelties.

The Manhattan Equipment Co., as the successors of the old firm of Reginald Canning & Co., will continue the business at 115 Broadway, New York City, under the management of Mr. Thomas B. Inness, who has been in the railroad equipment business for a number of years, and has been connected with the above firm during the past year.

The Hon. T. H. Anderson, United States Minister to Bolivia, says, in a recent letter to the Department of State, Washington, D. C., that the industry of working wood by machinery is a growing one in South America, and the trade for all classes of wood working machinery is given to the United States. And he further says that the Egan Co., of Cincinnati, controls over 50 per cent. of this trade.

Iron and Steel.

The rail mills of the Bethlehem Iron Co. have again shut down for an indefinite period. Twelve hundred men have been thrown out of employment.

The Joliet mills of the Illinois Steel Co. closed down Jan. 1 for repairs. It is thought the mills will not start until April. Over 2,000 men will be thrown out of work.

New Stations and Shops.

The Scranton Traction Co., of Scranton, Pa., has placed the contract for the buildings of its new plant with the Berlin Iron Bridge Co. The boiler and engine room will be 65 ft. wide × 200 ft. long, with a machine shop and car shed 93 ft. wide × 225 ft. long. The entire plant will be fireproof, of the well known Berlin construction.

The Bullen Bridge Co., it is understood, is arranging to establish shops in Pueblo, Col.

The Jones Vestibule Sleeping Car Co. has purchased five more acres of land adjoining its property, some six miles west of Denver. Work, it is reported, is being rapidly pushed forward on the new buildings. The number and dimensions of these are given as follows: A mill, 80 × 250; setting-up shop, 80 × 250; paint shop, 80 × 250; blacksmith and machine shop, 60 × 250; foundry, 60 × 200; and brass foundry, 35 × 40.

Smoke in Philadelphia.

An ordinance designed to abate the smoke nuisance in Philadelphia has been favorably reported by the Committee of Municipal Government of the City Council of Philadelphia. The ordinance makes it a nuisance to run a locomotive or stationary engine using soft coal as a fuel and emitting large volumes of black smoke. The City Solicitor gave an opinion to the effect that the ordinance is legal if it does not prohibit the use of bituminous coal and is not unduly burdensome in its application.

The Bargeon Compound Rail.

The reader who is curious in such matters will probably remember that a compound rail was laid some time ago for experiment in the Oakland yard of the Southern Pacific. The rail consists of two pieces; the lower portion has a double vertical webb, making a trough to receive the webb of the upper portion, and the two portions are fastened by numerous rivets. A railroad man who has recently seen these rails says that nearly all of them are in the scrap heap. They broke or cracked through the rivet holes and were pronounced a complete failure.

Compound Wire for Electrical Purposes.

Attempts to turn out an improved wire for overhead telegraph purposes have of late been made in Germany, and apparently with encouraging results. Mr. Elsässer recently remarked before the Electrotechnischer Verein, of Berlin, that besides the bronze wire already used in telephone installations and which, during the past year, also has come into favor for telegraph service, several other kinds of wire have been employed experimentally, among them the so-called "compound wire," consisting of a cast steel core and an outside layer of copper. This wire, it is said, has proved itself very satisfactory, and has specially commended itself for service along the sea coasts where there is much exposure to fog and dampness generally. It is reported to have been found that in this wire the copper exterior adheres perfectly to the steel body, and does not tend to peel off even after bending the wire a large number of times. One of the other kinds of wire under trial consisted of an aluminum bronze core with a copper bronze envelope. This wire which is said to be of great tensile strength, and to have a comparatively low electrical resistance, is considered as specially adapted to take the place of the plain bronze wire already in use.

A Noiseless Exhaust for Gas Engines.

Mr. P. Simon describes in *L'Electricien* a device for lessening the objectionable noise made by the exhaust from gas engines, which is extremely simple. The end of the exhaust pipe is formed of a piece of pipe which is split for a length of about 6½ ft. and the upper end spread until the slotted opening has a width about equal to the diameter of the pipe. This simple arrangement is said to work very satisfactorily.

A Tunnel for Boston.

The City Engineer of Boston. Mr. William Jackson, has prepared plans for a tunnel connecting East Boston with the city proper. Plan A contemplates a single tunnel with inclined approaches, and is designed for two lines of street cars and a walk 10 ft. wide for pedestrians, with passenger elevators on both near the pier lines. This tunnel will be about 5,000 ft. long and will cost $3,315,000. Plan B contemplates two tunnels with inclined approaches under the channel on route No. 1, each tunnel being designed for a single street car line and a walk 6 ft. wide for pedestrians, with passenger elevators on both sides of the water. Length, about 5,000 ft.; cost, including land damages, $3,996,000. Plan C contemplates a single larger tunnel, but instead of having inclined approaches, there are sets of three passenger and three street car lifts at each end of the tunnel. Length of tunnel, about 2,500 ft.; cost, including land damages, $2,460,000; land damages estimated at $147,000. Other alternative plans are for team traffic only. The above estimates have been based on an iron tunnel, lined with brick.

THE SCRAP HEAP.

Notes.

The New York, Lake Erie & Western has put its shopmen on eight hours a day and discharged some.

The Ohio & Mississippi has raised the wages of telegraph operators, the minimum monthly rate to be $45, except on the Springfield Division, where it is to be $42.50.

A North Carolina paper states that the Seaboard Air Line used snow plows on Dec. 27 and 28, and that the last time they were used was in 1884, late in the spring. This probably means small plows attached to the cowcatcher.

Burrel Forgey, the second of the train robbers who attacked a Chesapeake & Ohio train Dec. 14, has been convicted and, with his companion, sentenced to imprisonment for life. The ticket collector of the train in question received from the company a gift of $100 in recognition of his bravery.

The Baltimore & Ohio has raised the wages of its train men, apparently conductors and brakemen of freight trains mostly. It does not appear whether the increase is wholly on the lines west of the Ohio River, as has heretofore been reported.

About 20 men have been arrested at Erie, Pa., for robbing cars in freight trains of the Lake Shore & Michigan Southern, and it is said that warrants have been issued for 50 others. The press reports indicate that heavy losses have been suffered, and that the detectives hav been at work on the case for several months. So far as appears from the dispatches, the men are not employés of the railroad. Nearly 100 houses were searched in Erie, and goods were found in many of them.

The Illinois Railroad Commissioners have had their Consulting Engineer make an examination of the line of the Peoria & St. Louis from Springfield to Havana and from Springfield to Mount Olive. In the report of this examination the engineer says that the road is unsafe. Orders were issued to the company that the road must be put in the condition specified in the engineer's report. The company has until Jan. 17, 1893, to show cause why such repairs should not be made. In the judgment of the commissioners trains should not be run over the line at a faster rate than fifteen miles an hour.

Senator Frye has introduced in Congress a bill authorizing the appointment of a commission to again go over the question of the indebtedness of the Pacific railroads. The bill purports to be for the purpose of "settling claims growing out of the issue of bonds by the United States to aid in the construction of the Pacific railroads, and to secure to the United States payment of their indebtedness." The President is authorized to appoint a commission of two Republicans and two Democrats and one member of the People's party, for a term of one year, with authority to extend to two years, at an annual salary of $10,000 each and necessary expenses, to be paid jointly by the United States and the railroads interested. An appropriation of $100,000 for the purpose of finding out facts which are already known is certainly a fine stroke of business. Senator Frye has evidently joined the crowd of those who fear the dangers of a surplus in the treasury.

World's Fair Notes.

The Egan Co., of Cincinnati, builders of wood working machinery, will make the finest display in the machinery department of the World's Fair that they have ever made in that line. Novel time and labor saving machines will be shown in practical operation.

The Yerkes telescope for the University of Chicago will be exhibited in the Manufactures Building. It will probably be placed at the north end of the building just south of the gallery. The completed instrument will weigh about sixty tons. The object glass is 40 in. in diameter and the tube complete is about 75 ft. long.

The Brooks Locomotive Works will exhibit at the World's Fair a mastodon-type locomotive on an ornamental stone pedestal 25 ft. high and 60 ft. long. This engine will be one of the largest and most powerful ever constructed. It has already been sold to the Great Northern, and as soon as its mission as an embellishment to the Fair Grounds is ended it will be delivered to that company. In the Transportation Department of the Exposition the Brooks Works has been awarded advantageous space for placing eight additional locomotives, consisting of consolidation, switching, suburban, fast ten-wheel and American eight-wheel passenger locomotives. The Brooks Works will exhibit also its two-cylinder compound and four-cylinder tandem compound locomotives.

It is announced that the following scheme of awards has been adopted for the Exposition. There will be a board of judges, which is to be composed, as far as practicable, of competent experts, and be divided into 13 committees—one for each of the large departments of the Exposition, according to the official classification. The number of judges composing this board is to be determined hereafter. There is also to be a board of examiners not exceeding seven in number. Each exhibit is to be examined and reported on by one of the judges, the report being sent to the executive committee on awards, and a copy being sent to the exhibitor. After allowing six days in which an appeal or protest against the finding of the judge can be filed,

the report will be acted upon by the committee of the board of judges having that class of exhibits in charge, which will render a final opinion. In case of protest or appeal one of the examiners will be detailed to report on the exhibit, and it will be re-examined by a special committee of the judges, who will make a special report, taking cognizance of the examiner's report. It will be finally acted upon by the committee of judges having charge of the class of exhibits under consideration. Provision is made for the filing of objections to any individual judge, for the appointment of at least one woman on all committees on exhibits produced in whole or part by female labor, and for the appointment of foreign representatives. The work of the judges is to commence not later than June 1, 1893, and is to continue uninterruptedly until the completion of the work, excepting in certain departments where the nature of the exhibits requires renewals.

Railroads of New South Wales.

The Treasurer of New South Wales, Mr. See, in his budget statement in the Legislative Assembly, has stated that the total revenue from the state railroads for the year amounted to £3,250,000, thus showing a deficiency of only £90,000 after paying working expenses and interest on loans.

A Metallurgical Gascon.

The following is a delightful specimen of that ingenuous commodity known as "Yankee brag," at which we Britishers are so frequently prone to convulsively laugh in our sleeves. The sentence forms the commencement of a leader in the last issue of a New York paper, the *Engineering and Mining Journal:* "The wonderful progress which has characterized American mining and metallurgy during the last quarter of a century, and which has made them standards and models for the whole world, has been due, in no small degree, to the *Engineering and Mining Journal*"! For pure bragartism this effusion is, we should imagine, hardly to be excelled.—*Iron.* To "convulsively laugh in our sleeves" is pretty good, too.

The Vienna-Buda-Pesth Electric Railroad.

Some of the comments made in German and Austrian technical journals on the proposed high-speed electric railroad to connect Vienna and Buda-Pesth, already noticed in the *Railroad Gazette*, are to the effect that the cost of the contemplated installation will be much too high for a profitable undertaking. The estimates of the projectors, Messrs. Garry & Co., of Buda-Pesth, put the probable cost of the 240-kilometre line at from 240,000,000 to 280,000,000 francs, or about 1,000,000 francs for each kilometre. The prospective receipts of the line, it has been pointed out, would not begin to cover the interest on the invested capital. Doubt is expressed also as to the possibility of attaining the contemplated high speeds.

Government Railroad Statistics for 1892.

A preliminary report on income and expenditure of railroads for the year ended June 30, 1892, has been completed by the statistician of the Inter-State Commerce Commission, and he publishes a summary of it, from which we extract the following:

The gross earnings of 128,350 miles of road are shown to have been $951,025,159, from which the gross earnings of all the roads are estimated to have been $1,222,711,698. This is an increase of $125,950,303 over the earnings of the previous year, or an increase of $608 per mile of line. The operating expenses for the year were $814,722,082, being an increase of $82,834,189, which leaves an increase in net earnings of $43,116,114, or $2,472 per mile of line. The actual increase in revenue from passenger service was $31,500,038, or $247 per mile of line, as against an increase in the revenue from freight service of $91,506,671, or $349 per mile of line.

The report shows that the aggregate gross earnings of 62 roads, each of which enjoys an income in excess of $3,000,000, is $794,478,631. A classification of the 62 roads in question shows that eight receive an income in excess of $20,000 per mile of line and ten between $13,000 and $20,000.

The New Broad Street Station.

The Pencoyd Iron & Steel Co. has been awarded the contract by the Pennsylvania Railroad for the iron work to be used in constructing the new train shed of the Broad Street Station at Philadelphia and the girders and supports of the new buildings. The Union Switch & Signal Co. has been awarded the contract for putting in an electro-pneumatic interlocking switch and signal system. The improvements at this terminus include the building of six tracks from the station to West Philadelphia, and the widening of the bridge across the Schuylkill River, which at present has three tracks. The plans for the new bridge have been prepared, and permission asked of the city government to begin work upon it.

Rather Hard on the Demurrage Rules.

A Wilkesbarre despatch says that, in spite of the extreme cold weather, there appears this week to be a dearth of orders and great overstocking of coal in the city and valley. Superintendent Lowell, of the Lehigh & Wilkesbarre Coal Co., says that his company has 17 miles of loaded coal cars on railroad sidings awaiting sales.

Deep Waterways.

The deep waterway convention has been called by the Duluth Chamber of Commerce, to meet at the Arlington Hotel, Washington, D. C., on the 12th inst. The call points out that Canada is hastening by every means in her power the completion of her canal at the "Soo" and the enlargement of her St. Lawrence canals "doubtless with the intention of being able, in a few years, to impose prohibitive tolls on American traffic." Governors of states and prominent citizens interested in a deep water way from Duluth to New York constructed and controlled by the United States are invited to attend. The enlargement of the Erie canal to a capacity sufficient th accommodate the traffic between Chicago and Duluth and Buffalo seems to many a logical sequence to the expenditures of a general government on the lake channels.

Street Railway Projects.

A franchise has been granted by the city of Guthrie, Oklahoma, for an electric street railroad, and a company has been formed to commence work at once on the construction of three miles of road. Edward Morton & Co., 53 Broadway, New York, have the matter in hand.

Arrangements have been effected through the agency of Edward Morton & Co., 53 Broadway, New York, for the conversion of the street railroad system of Lancaster, O., into an electric road. This embraces the changing of the present horse car road of about four miles into an electric line and extending the road six miles.

The Chesapeake & Ohio's New Coal Field.

The active work of developing the coal lands in the New River district of West Virginia, purchased by Drexel, Morgan & Co., in the interest of the Chesapeake & Ohio Railroad, mention of which was made in the *Railroad Gazette* of Dec. 23, will probably begin early in the spring. The transfer of deeds is about completed, and the new owners are negotiating with well known coal and coke operators who will lease the land in tracts for development. The lease will be made on a basis of 10 cents a ton royalty to the owners on all coal mined, the same as the rate along the Norfolk & Western in Virginia. The indications are that coal will be extensively mined by the time the Chesapeake & Ohio's branches are ready to receive freight.

LOCOMOTIVE BUILDING.

The Rhode Island Locomotive Works has been awarded the contract for building sixteen 28-ton, two cylinder compound locomotives for the Sea Side & Brooklyn Bridge Elevated Road. Eight of these engines are to be delived in April and the balance in July.

CAR BUILDING.

The Grand Trunk, it is reported, is having 200 special passenger cars built for the World's Fair traffic.

The Middletown Car Works, of Middletown, Pa., are now busy with an order for 300 cars for the Burton Stock Car Co.; also a large order for coal cars for the Pennsylvania & Northwestern.

The Central Vermont has put on a new train of cars, recently completed by the Wagner Palace Car Co. The train is composed of a day car, smoking car, combination car and Wagner sleeping car, all finished in mahogany.

The Sea Side & Brooklyn Bridge Elevated Road, an extension of the Brooklyn Elevated Road, has awarded a contract to Osgood Bradley & Sons, of Worcester, Mass., for 60 passenger cars. They will cost $3,500 each and one-half of them are to be delivered in April and the balance in July of this year.

BRIDGE BUILDING.

Baltimore, Md.—The Campbell Zell Co. was awarded, last week, the contract for the new Baltimore street bridge over Jones' Falls at $29,932, which was the lowest bid received. It was nearly $2,500 lower than any other bid offered, and $6,868 lower than the former bid of the Campbell-Zell Co. The other bids were as follows: King Bridge Co., $32,249; Ross & Sanford, $32,950; Youngstown Bridge Co, $34,540; Groton Bridge & Mfg. Co., $34,950; Penn. Bridge Co., $35,000; Wrought Iron Bridge Co., Canton, O., $35,345; Toledo Bridge Co., $35,500; Pittsburg Bridge Co., $36,200.

Brunswick, Md.—The Town Council of Brunswick has granted the London County & Berlin (Brunswick) Co. the right to build a bridge over the C. & O. Canal, Bridge avenue and Canal avenue. The bridge is to be finished in May, 1893. The pillars now standing in the Potomac River will be raised 14 ft. additional.

Kettle Falls, Wash.—The California Bridge Co. will build the bridge on the Spokane Falls & Northern Rail road over the Pend d'Oreille River, twelve miles above Northport.

Long Island City.—Col. G. L. Gillespie, United States Engineer, gave a hearing this week on the application of the Long Island Railroad to reconstruct its bridge over the Dutch Kills, as the mouth of Newtown Creek is called. The company proposes to replace its present two-track bridge with a single draw, with a bridge carrying three tracks and with two draws each 50 ft. wide. If the authority of the Secretary of War is secured, the company promises to complete the new bridge by July 1.

Marfield, Wash.—The County Commissioners have accepted the bridge across the Nisqually River near Marfield, which was built by the San Francisco Bridge Co. It is a Pratt truss combination bridge 160 ft. in length, and cost $2,800.

Philadelphia.—Director Windrim has awarded to J. H. Hathaway & Co. the contract for building a bridge over Front street, where it crosses the Richmond branch of the Reading railroad. The contract price is $11,500.

Radford, Va.—G. T. Kearsley will receive bids until Jan. 10 for erecting an iron and steel bridge across Connally's Branch.

Tioga, Pa.—A county bridge has just been completed over the river at Tioga, Pa., at a cost of $10,000.

Wheeling, W. Va.—On last Friday Engineer W. Hildenbrandt, of New York, who has made the plans for a new highway bridge, 930 ft. in length, with four road ways and double sidewalks for the Wheeling & Belmont Bridge Co., to span the "Back" Ohio River between Wheeling Island and Bridgeport, O., opened bids for the work. The bids were all found to be unsatisfactory and new bids will be asked, and affairs will likely be in shape to begin work early in the spring.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Georgia, the Supreme Court holds that a judgment against a railroad company for injury to a servant will not be disturbed on the ground that he was employed by its lessees, where, although there was evidence tending to show that the road had been leased, and that he had notice of it, he testified that the road on which his train ran was known by defendant's name, that the cars and engines bore that name, and that he was employed by a conductor without asking the name of the company, and the conductor testified that the tickets were then and are now issued in defendant's name.[1]

In Maine the plaintiff town held about one-twentieth of the bonded debt of a railroad company, and a much less proportion of its stock. Defendant towns held the balance, and voted to sell the road, having obtained the consent of the legislature to its sale. Plaintiff voted against the sale. The Supreme Court holds that it was the right of the majority to control, such action of the majority not being fraudulent, collusive, or oppressive.

The Supreme Court of Alabama rules that conveyances to a railroad company of right of way over and the fee in lands abutting on and included in a public road vests in such company no exclusive or other right to use said public road for railroad purposes, nor can it acquire such right without authority from the state.[2]

In Georgia the Supreme Court decides that whether a chartered railroad company procures its right of way directly, by its own contracts, or indirectly, through the intervention of a construction company employed by it, it is bound to perform all the undertakings inserted in deeds made to it, conveying the right of way, provided it operates and uses its railroad over the premises to which the conveyances apply; and a delivery of a deed to the construction company is delivery to the railroad company, if the latter has taken and enjoyed the benfit of such deed by appropriating and using the right of way which the deed in express terms conveys directly to the railroad company.[4]

In the same state the same court holds that a chartered railroad company may contract jointly with individuals in settlement of litigation to which it is a party, and bind itself jointly with them to construct, keep up and perpetually maintain stop gaps and road crossings across its track on the premises involved in the litigation.[5]

In Iowa the Supreme Court holds that the public has such a right or interest in the "adequate means of crossing" a railroad, which Code, §1268, require the company to construct where a person owns land on both sides of the track, that it may compel the company to observe its duty, where the track divides a pasture so that it is necessary that the owner's stock cross the track daily.[6]

In Texas the Supreme Court rules that the statute of 1887 providing that, in the event of a railroad company refusing to pay its indebtedness to an employé within 15 days of demand, "it shall be liable to pay such employé 20 per cent. on the amount due him as damages, in addition to the amount due," is special legislation, not protecting alike the interest of employer and employé, and is unconstitutional.[7]

The third section of the Interstate Commerce Act, as amended by the laws of 1889, provides (1) that every common carrier shall provide equal facilities for the interchange of traffic with connecting lines; and (2) that there shall be no discrimination in rates and charges between such lines. A petition presented by a line affected, averred that petitioner was deprived by respondent of equal facilities with a competing connecting line for interchange of traffic, a discrimination in rates, the withdrawal of a joint through traffic, and a threat to close a through route via petitioner's line. The Federal Court rules a charge, not only of discrimination in rates, but of failure to provide equal facilities for interchange of traffic, and to bring before the commission the determination of both offenses.[8]

In Kansas the Supreme Court rules that a condition in the vote of bonds by a county in aid of a railroad company, that it shall establish and maintain a division terminus at a point situated between two named cities in the county, is substantially complied with if the terminus is established at a point on the line of the road between the two cities a few rods off from a direct line between them.[9]

In Texas it is held by the Supreme Court that in an action for injuries to a passenger on defendant's train, while the road was operated by a receiver, where, after the injury and before suit, the receiver was discharged, and the property returned to defendant, together with all betterments made from earnings during the receiver ship, defendant, rather than the receiver, is liable for the injury.[10]

The Supreme Court of Pennsylvania rules that where a railroad is bound to maintain a highway bridge over its tracks, it is liable to one injured by the defective maintenance of the bridge, and such liability is not negatived by the fact that the injured party might have sued the township for failure to keep the highway in repair.[11]

Injuries to Passengers, Employes and Strangers.

The Supreme Court of Michigan hold that where a brakeman is injured because of a car being negligently loaded, the fact that the car has been received from another road loaded as it was is no defense.[12]

In this case a brakeman, while coupling flat cars, was injured by reason of there being insufficient room between the end of one car and the lumber on the other car, which was so loaded as to project beyond the end of the car. The Supreme Court rules that it being the duty of the company to furnish a safe place for coupling; it was not excused by its having furnished an inspector, such inspector not being a "fellow servant."[13]

The Federal Court holds that the mere starting of a freight train unexpectedly to a brakeman who is thereby thrown from the rear car, is not actionable, unless such starting was suddenly, violently, or negligently done.[14]

The Supreme Court of Oregon holds that in an action against a railroad for injuries to a conductor caused by his train running into a snow slide, if defendant's section foreman, whose duty it was to see that the track was clear, knew of the snow slide, and failed to inform plaintiff thereof, there was negligence of a vice principal such as to render defendant liable.[15]

In Georgia the Supreme Court rules that a judgment against a railroad for injury to a servant will not be disturbed where it appears that the injury was caused by the negligence of the engineer in starting the engine while plaintiff was coupling cars, without waiting for a signal to do so.[16]

In Missouri it is held by the Supreme Court that where a brakeman, in violation of his duty, failed to set the brakes on cars left on the main track while other cars were being side-tracked, and the unsecured cars ran down a grade and collided with an approaching train, killing a fireman thereon, the company is not liable for his death, the brakeman being a fellow servant.[17]

The Supreme Court of Georgia holds that a provision in a contract of hiring, that the servant "will take upon himself all risks connected with or incident to the employment, and will in no case hold the company liable for any injury or damage, to his person or otherwise, he may sustain while thus employed, whether it arise from explosion, or the machinery, or accident, or the negligence or misconduct of himself or any other person employed by the company, or from any other cause," covers all negligence, including that of the employer in failing to keep the machinery in safe condition, and in omitting to have it properly inspected, to ascertain its condition, and is valid.[18]

In Alabama the Supreme Court rules that a hand car is a car within the meaning of the law, allowing recovery by an employé of his employer for personal injuries received in the employment by reason of the negligence of an employé of the same person having charge of an engine, car or train on a railroad.[19]

In Massachussetts it is held by the Supreme Judicial Court that where a railroad maintains a platform along its track, on which trainmen are obliged to walk, the company must not only employ suitable persons to keep the platform in repair, but must also use reasonable diligence to see that they do so.[20]

In Rhode Island the Supreme Court rules that evidence that a railroad company's "tell-tale," though safe for cars of an ordinary height, was dangerous for brakemen upon cars of a greater height, which have come into use for special purposes, shows a breach of the company's duty to provide its employés with safe appliances, and a danger not manifest or a risk ordinarily incident to a brakeman's employment.[1]

The Supreme Court of Colorado decides that where a railroad company, engaged in the construction of its road, causes the single spiking of three ties and an entire omission to spike the fourth, upon a curve of five or six degrees, it is guilty of such negligence as was not contemplated by the contract of a construction employé passing over the track on a car, without knowledge of such negligence, and the company is liable for his injury on the car's being derailed, because of such insufficient spiking.[2]

In Illinois the Supreme Court rules that it is no defense to an an action against a railroad company for injuries caused by a defective track used by the company that such track did not belong to the company.[3]

In Pennsylvania the Supreme Court holds that where one, in attempting to cross a railroad track, is struck by an approaching train, which was plainly visible from the point occupied by him when it became his duty to stop, look and listen, he will be conclusively presumed to have disregarded the rule requiring him to stop, look and listen, and to have gone negligently into danger.[4]

[1] Northeastern R. Co. v. Barnett, 15 S. E. Rep., 492.
[2] Waldoborough v. K. & L. R. Co., 24 Atl. Rep., 942
[3] Western R. of Ala. v. Alabama G. T. R. Co., 11 S. Rep., 483
[4] C. R. & C. R. Co. v. Davis, 15 S. E. Rep., 626
[5] C. R. & C. R. Co. v. Davis, 15 S.E. Rep., 626
[6] State v. Mason City & Ft. D. R. Co., 52 N. W. Rep., 490.
[7] S. A. & A. P. Ry. Co. v. Wilson, 19 S. W. Rep., 910.
[8] N. Y. & N. Ky. Co. v. N. Y. & N. E. R. Co., 50 Fed. Rep., 867.
[9] C. K. & W. R. Co. v. Harris, 30 Pac. Rep., 456.
[10] T. & P. R. Co. v. Bloom, 20 S. W. Rep., 133.
[11] Gates v. Penn. R. Co., 24 Atl. Rep., 638.
[12] Dewey v. D., G. H. & M. R. Co. 52 N. W. Rep., 492.
[13] *Id.*
[14] Johnson v. Can. Pac. Ry. Co., 50 Fed. Rep., 886.
[15] Fisher v. O. S. L. & U. N. Ry. Co., 30 Pac. Rep., 425.
[16] Northeastern R. Co. v. Barnett, 15 S. E. Rep., 492.
[17] Relyea v. K., C., Ft. S. & G. R. Co., 19 S. W. Rep., 1,116.
[18] Fulton Bag & Cotton Mills v. Wilson, 15 S. E. Rep., 322.
[19] Kansas City, M. & B. R. Co. v. Crocker, 11 South. Rep., 262.
[20] Sweat v. B. & A. R. Co. (Mass.), 31 N. E. Rep., 296.
[21] Darling v. N. Y., P. & B. R. Co., 24 Atl. Rep., 462.
[22] Col. Mid. Ry. Co., v. Naylon, 30 Pac. Rep., 249.
[23] Wis. Cent. R. Co. v. Ross, (Ill. Sup.) 31 N. E. Rep., 412.
[24] Myers v. B. & O. R. Co., 24 Atl. Rep., 747.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cleveland, Cincinnati, Chicago & St. Louis, semi-annual, 1½ per cent., payable Feb. 1.

Delaware, Lackawanna & Western, quarterly, 1¾ per cent., payable Jan. 20.

Evansville & Terre Haute, quarterly, 2½ per cent., payable Jan. 25.

Hancock & Calumet, semi-annual. 2½ per cent., payable Jan. 15.

New York Central & Hudson River, quarterly, 1¼ per cent., payable Jan. 16.

Chicago, Rock Island & Pacific, quarterly, 1 per cent., payable Feb. 1.

Lake Shore & Michigan Southern, semi-annuul, 3 per cent., payable Feb. 1.

Michigan Central, semi-annual, 3 per cent., and payable Feb. 1.

Petersburg, annual, 3 per cent. on the common and preferred stock, payable Jan. 3.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Barclay, special, Philadelphia, Jan. 16.

East Broad Top Railroad & Coal Co., annual, Philadelphia, Pa., Jan. 9.

East Mahanoy, annual, Philadelphia, Pa., Jan. 9.

Indiana, Illinois & Iowa, annual, Kankakee, Ill., Jan. 18.

Louisville & Nashville, annual, Louisville, Ky., Jan. 9.

Malone & St Lawrence, special, New York City, Jan. 16, to take action upon a proposition to lease the road to the Central Vermont.

New York & Long Island, annual, New York City, Jan. 18.

Philadelphia & Reading, annual, Philadelphia, Pa., Jan. 9.

Philadelphia, Wilmington & Baltimore, annual, Wilmington, Del., Jan. 9.

Pickering Valley, annual, Philadelphia, Pa., Jan. 9.

Terre Haute & Peoria, annual, Decatur, Ill., Jan. 18.

Texas, Sabine Valley & Northwestern, special, Longview, Tex., Feb. 13, to increase the capital stock.

Western New York & Pennsylvania, annual, Philadelphia, Pa., Jan. 9.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Wednesday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul. Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma. Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

American Railway Master Mechanics' Association.

The secretary announces that the twenty seventth annual convention of the association for 1893 will be held at Lakewood, N. Y., with headquarters at the Kent House, commencing Monday, June 19. There are two hotels close together, and the proprietor of the Kent House will receive all applications for rooms and locate the guests. His address is Jno. C. Brady, Kent House, Lakewood, on Chautauqua Lake, N. Y. The hotels agree to a uniform rate of $3 a day. Messrs. R. C. Blackhall, T. A. Bissell and Angus Sinclair are a committee of arrangements for this convention.

American Society of Civil Engineers.

At the meeting of Jan. 4 a paper by Alva J. Grover, Assoc. M. Am. Soc. C. E., was read on "Flood Waters in Sewers and Their Automatic Measurement." The writer puts the paper forward, not as absolutely correct, but as being a contribution to the general subject. He describes the rain gauge employed, which is a modified form of that of the U. S. Weather Bureau. There are two tops, $\frac{3}{10}$ in. in diameter, the water from one being carried to a cylinder in which it is measured directly by a stick gauge; the water from the other going to an apparatus by means of which a continuous record is made au omatically. The sewer gauge consists of a galvanized iron boat, 3 ft. long, 1 ft. wide and 6 in. deep, which is held in place near a manhole, but with entire freedom to rise and fall. This carries a longitudinal shaft, on which, at the stern of the boat, is a screw 18 in. in diameter. The flow of the sewage causes this to revolve, and, by means of gearing, the motion is transmitted to an electric key and recorded. The rise and fall of the boat is also recorded. A continuous record can be obtained for 26 hours.

In the experiments described, the gauge was fixed in an 8½ ft. circular sewer, which drained 2,100 acres. The longest dimension of this area was 11,000 ft., and the slopes varied from less than 1 to 18 per cent. The sewers were not well proportioned for the work to be done, and at the junction of the two mains there was constant flooding. One hundred and fifty feet below the gauge the sewer was changed in form to a semi-elliptic invert, 16 × 5 ft., covered with steel beams. The grade at and for 418 ft. above the gauge is .0057 to 1. There were 40,000 people in the district, which at 100 galls. per head would make 53,333 cu. ft. per day, to which springs along the line added somewhat. Two large breweries, a number of factories, etc., discharged into the sewer.

The writer next describes six experiments upon the working of the gauge. With a rainfall of 0.77 in., $\frac{3}{10}$ of which came in 10 minutes, the summit of the flood was reached in 11 minutes after the dash was over. With a rainfall of $\frac{3}{10}$ in. falling steadily for 30 minutes on the 2,100 acres, the summit of the wave will be at the mouth of the sewer when the rain ceases. In a subsequent rain coming in three dashes, as many distinct fluctuations were shown in the sewer, following quickly the successive falls of rain. A daily normal flow sheet shows the relative daily velocity of the sewage and illustrates the regularity and precision of the gauge.

Engineers Club of Cincinnati.

At the November meeting. Col. Latham Anderson read a paper giving some suggestions concerning the proposed Miami & Erie Ship Canal, a bill to appropriate $10,000 for the survey of which was introduced in Congress last winter by Senator Caldwell, and another by State Senator Gear for the issue of $40,000,000 of state bonds, the proceeds to be devoted to the building of the canal. The dimensions of the canal as contemplated by the Caldwell bill are: width on flow line 150 ft., depth, 15 ft.; width on bottom, 105 ft.

The fifth annual meeting was held on Dec. 15, with 31 members present. The reports of the Secretary and Treasurer were presented, showing the club to be in a satisfactory condition. The following officers were elected to serve during the coming fiscal year; *President*, Col. Latham Anderson; *Vice-President* W. B. Ruggles; *Directors*, M. D. Burke, Chas. A. Ewing and H. L. Hoeffer; *Secretary and Treasurer*, J. F. Wilson. The retiring President chose for the theme of his annual address "Ethics of Engineering," and his paper was ordered printed for distribution. The customary annual lunch was served.

Engineers' Club of Philadelphia.

A regular meeting was held Dec. 17, 1892. President James Christie in the chair; 45 members present.

Mr. Edward Hurst Brown read a paper on "Paint as Used on Engineering Constructions," in which he described the composition of paints for use on wood and metal surfaces, with particular attention to the proper material to use on structural iron work. For use on iron exposed to changes of temperature, to gases or moisture, a paint was recommended called anti-rust which is manufactured especially for this purpose. Sections of iron pipe were shown which had been painted with this material, and with other kinds of paint, and exposed to various severe conditions of temperature and oxidizing gases.

HIGH SPEED ON RAILROADS.

The Secretary opened the discussion by calling attention to the run of a Philadelphia & Reading express train on Nov. 18, between Philadelphia and New York. The particulars of this run were given in the *Railroad Gazette* of Nov. 25, page 886. In the discussion Mr. John C. Trautwine, Jr., said: "The passenger transportation system of the future will, I think, find itself more or less completely divorced from the freight system, and when we have come to regard 80 or 100 miles per hour as an every-day affair, I believe we shall have abandoned the imitation of the stage coach, with its centre of gravity several feet above its base, and our vehicles will be suspended from rather than supported by the rails. It is safe, too, I think, to predict that instead of heavy trains dispatched daily or hourly, single light vehicles will follow each other at comparatively very short intervals. But if we are to witness this great development of speed without a revolution in our present methods, I think this will be by a process of growth very much like that which brought us to our present speeds and to the present dimensions of our railroad system, rather than by a sudden leap.

"It is, nevertheless, of great interest to have the estimate of so capable and experienced an engineer as Mr. Churchill, as to what these dimensions may be expected to be. Let us then briefly consider this estimate in some of its details. As to grades—it appears to me that if, in the future, we are to submit to the same *variation* of speed as now, no material change in grade will be required; for the matter of grades applies rather to *uniformity* of speed than to the speed itself. Again, if in order to maintain uniform a high rate of speed, we improve the gradients by lengthening the line, we may thus offset the advantage due to the gain in speed. As to curvature—so little is known respecting the relation between curvature and speed, that we think it is only by guesswork that we can fix, in advance, the limit of curvature or the amount of superelevation required for these high speeds. Certainly, however, as Mr. Churchill says, such speeds will demand a lengthening of radii. As to drawbridges—it is difficult to see how these could, in all cases, be avoided, however careful the location. Here, too, a long detour may involve as great a delay as would be entailed by the draw. As to cross ties—I am surprised to find that Mr. Churchill specifies a quantity of wood per mile but little, if any, greater than that now in use, and this with a diminished width of tie. As to rails—with curvature limited to 1 deg. and 2 deg., as Mr. Churchill proposes, his 100-lb. rails might, perhaps, be found sufficiently heavy for the increased weights and speeds. Otherwise, since with a given radius the centrifugal force is proportional to the weight of the train and to the *square* of its speed, we would propose that so slight an advance upon present practice would be found insufficient. As to joints—it seems to me that the half-inch opening proposed would give rise to severe pounding under the increased loads and speeds. Mr. Churchill makes no allusion to the question whether continuous rails are generally practicable.

Engineers' Club of St. Louis.

The club met Dec. 21, 1892, at the Mercantile Club, President Johnson in the chair, and 39 members present. After supper the result of the election of officers for 1893 was announced. The following were declared to be elected:

President, Robert Moore; Vice-President, B. L. Crosby; Secretary, Arthur Thacher; Treasurer, Chas. W. Melcher; Directors, J. B Johnson and Geo. H. Pegram; Librarian, R. E. McMath and Members Board of Managers Association of Engineering Societies, J. B. Johnson and J. A. Ockerson.

Professor Johnson, the retiring President, gave an interesting addresss on the "Engineering Profession." The paper pointed out the growth of the profession and gave a number of interesting and valuable suggestions. Discussion followed, which was taken part in by Messrs. Meier, Nipher, Maxon, Winslow, Crosby, Ockerson. Eayrs, Flad and Condron.

For the next meeting a discussion of Mr. Colby's paper on the "Recent Survey of St. Louis" was announced.

Master Car Builders' Association.

The twenty-seventh annual convention of the Master Car Builders' Association for 1893 will be held at Lakewood, N. Y., with headquarters at the Kent House, commencing Tuesday, June 13, 1893. There are two hotels near together, and the proprietor of the Kent House will receive all applications for rooms and locate the guests. His address is Jno. C. Brady, Kent House, Lakewood, on Lake Chautauqua, N. Y. The hotels agree to a uniform rate of $3 per day when nothing extra is wanted."

PERSONAL.

—M. C. Kennedy, a son of President Kennedy, of the Cumberland Valley road, has been made Vice-President of the company, the appointment taking effect from Jan. 2.

—Mr. Horace Tucker, formerly General Freight Agent of the Illinois Central road, has been appointed Superintendent of admission to the World's Columbian Exposition.

—Mr. A. M. Stewart, General Live Stock Agent of the Cleveland, Cincinnati, Chicago & St. Louis, who retired Jan. 1, had been in the employ of the Bee Line, now part of the Big Four lines, 39 years.

—Mr. A. T. Dice, Supervisor of Signals on the New York Central & Hudson River, has been made Assistant Division Superintendent of the Hudson Division. He will continue to have charge of the signal department.

—Mr. J. N. Faithorn, formerly chairman of the Western Freight Association, and later Chairman of the Southwestern Railway & Steamship Association, has been appointed General Manager of Street's Stable Car Line, taking effect from Jan. 1.

—The employés of the engineering department of the Grand Trunk, under Mr. J. T. Lloyd, Assistant Engineer, stationed at Richmond, tendered him a banquet upon his retirement from the railroad after 34 years of service. Mr. Lloyd will engage in business at Montreal.

—Mr. W. Dunbar Jenkins, who has been the Receiver, Chief Engineer and General Manager of the New Orleans & Northwestern road, but who resigned the Receivership some months since, retaining the position of General Manager, has now resigned that office and severed his connection with the road.

—Mr. Henry Johnson, Assistant General Manager of the Johnson Railroad Signal Company, has returned from Europe and resumed the duties of his position. Mr. Henry M. Sperry, General Agent, who has been filling Mr. Johnson's place and has been in the East for several months, has gone back to Chicago.

—Mr. Henry Goldmark has opened an office as a Civil Engineer in the Rialto Building, Chicago. He will make a specialty of the design, supervision and construction of all classes of structural work, particularly railroad and highway bridges, iron buildings and roofs, masonry structures and foundations.

—Mr. J. P. Bradfield, Superintendent of the Buffalo division of the West Shore road, will, on Feb. 1, assume the general superintendency of the New York, Ontario & Western, with headquarters in New York City. Mr. Bradfield has been with the West Shore since its organization and entered its service as Trainmaster of the Hudson River division.

—Mr. H. E. Felton, who has resigned the position of Assistant General Freight Agent of the Chicago & Eastern Illinois road to become General Freight Agent of the Evansville & Terre Haute, received a diamond stud from the officers and employés of the Chicago & Eastern Illinois. Mr. Felton's successor is William Campbell, and Charles B. Gregory succeeds Mr. Campbell as Manager of the Southern Dispatch.

— Mr. James Macbeth, Superintendent of Motive Power of the Adirondack & St. Lawrence, has tendered his resignation, having accepted the appointment of Master Car Builder of the Western division of the New York Central & Hudson River road, to succeed Mr. Eugene Chamberlain who becomes Manager of the Lancaster Malleable Iron Works. Mr. Macbeth was for five years Master Mechanic at the West Shore shops in Buffalo, until May, 1891, when he resigned to go to the Adirondack & St. Lawrence line.

—Mr. George Taylor, for many years General Freight Agent of the Intercolonial of Canada, died suddenly of hemorrhage of the lungs at Halifax, Dec. 29, aged 64. Mr. Taylor was connected with the old Nova Scotia Railroad up to the time of its completion to Pictou, and was Superintendent from 1867 up to the time of the amalgamation with the Intercolonial, when he was transferred to Moncton as General Freight Agent, which position he held up to a few months ago, when he was superannuated by the government.

—Mr. T. F. Rotheram, Locomotive Superintendent of the New Zealand Government Railways, is visiting this country en route to Europe. Mr. Rotheram, who has gained his railroad experience wholly on the New Zealand narrow-gauge lines, is a strong disbeliever in continuous brakes for either passenger or freight service, considering even a steam brake on the engine unnecessary, and trusting entirely to hand brakes on caboose or baggage car and tender only. It is to be hoped that he will note the excellent results obtained with quick acting brakes in this country.

—Mr. Rollin H. Wilbur, son of President E. P. Wilbur, of the Lehigh Valley railroad, this week succeeded the late H. Stanley Goodwin as General Superintendent of the Eastern Division of the Lehigh Valley road. His jurisdiction extends from Lehigh and Wilkes Barre Junction to Jersey City, and includes the coal branches. Mr. Wilbur is now about 30 years old and has had an extensive experience in practical railroad service. He was for many years assistant to Vice-President Sayre, of the Lehigh Valley, and on the lease of that road to the Philadelphia & Reading he became assistant to the General Manager. This fall he was reappointed assistant to Vice-President Sayre.

—The partnership firm of Reginald Canning & Co. dissolved on Dec. 30, and the senior member begins the new year as Assistant to the President of the Jackson & Sharp Co., of Wilmington, Del. Although still a young man, Mr. Canning has had a long and varied experience in rolling stock, which peculiarly fits him for his new duties. About 25 years ago he was in the service of the Ramapo Wheel & Foundry Co., which he left in order to establish the Cayuta Wheel & Foundry Co., at Waverly, N. Y. For the past 10 or 12 years he has been a member of the New York firm, buying and selling cars. Mr. Canning's well earned reputation for integrity and skill has enabled him to effect large transactions, and will stand him in good stead in the responsibilities he now undertakes.

—Mr. Benjamin F. Blue, formerly General Freight and Passenger Agent of the St. Louis, Alton & Terra Haute road, died at Murphysboro, Ill., on Christmas Day. Mr. Blue left the Cairo Short Line about three years ago and became sales agent of the Consolidated Co. of St. Louis. Lately he has been suffering with a mental disorder. Mr. Blue was born in Indiana in 1848, and had been a prominent railroad man for many years. In 1878 he was General Western Agent of the Nashville, Chattanooga & St. Louis, and later on General Freight and Passenger Agent of the Paducah & Elizabethtown. In 1880 and 1882 he was General Freight and Ticket Agent of the St. Louis & Southeastern. In 1882 and 1883 he was General Freight and Passenger Agent of the Chesapeake, Ohio & Southwestern, and in 1883 he entered the service of the Cairo Short Line.

—Mr. Joel May, who died at Hot Springs, Ark., last week, was one of the pioneers in railroad operations in the West. He was born at Douglassville, Berks County, Pa., and when a young man was a locomotive engineer on the Reading road. He left Pennsylvania about 35 years ago, and ran the first locomotive into the city of St. Paul. He engaged in railroad building in Minnesota and other states, and bought extensively of lands about Duluth, which, with his successful railroad enterprises, made him a wealthy man. He resided at St. Paul, became Superintendent of the St. Paul, Minneapolis & Manitoba road, resigning about 10 years ago, and subsequently was Superintendent of the St. Paul & Southwestern road, which he aided largely in building. A year or more ago Mr. May withdrew from active railroad work and located at Stillwater, Minn.

—Mr. A. E. Clark, General Passenger Agent of the Pittsburgh & Lake Erie, died at Pittsburgh, Jan. 2, aged 58 years. He was appointed General Passenger and Ticket Agent of the road in February, 1888, and had been previously connected with western railroads since 1858, chiefly in the traffic department. He began railroad life as a clerk on a line in Kentucky. From 1881 to 1885 he was General Passenger and Ticket Agent of the New York, Pennsylvania & Ohio. When that line was made a part of the New York, Lake Erie & Western system he was made Assistant General Passenger and Ticket Agent of the latter, and he continued in that capacity for two years. He was connected with the Atlantic & Great Western, the New York, Pennsylvania & Ohio and the New York, Lake Erie & Western 17 years.

—Mr. Eugene Chamberlin, Master Car Builder of the Western Division of the New York Central, with headquarters in Buffalo, has tendered his resignation, taking effect from Jan. 1. He is to be associated with Clarence E. Rood, of the Lancaster Malleable Iron Works, in which he will have an interest. Mr. Chamberlin has been connected with the New York Central over 18 years. Beginning as a boy in the West Albany shops, he passed through the various grades of promotion until he became Assistant Superintendent of shops. Then he was appointed Master Car Builder, and eight years ago was placed in charge of the shops in Buffalo. Later, he was given supervision over all the car construction and repair department of the Western Division. He is a member of the Executive Committee of the Master Car Builders' Association, and is President of the Central Railway Club.

—Mr. Ludwig Hagen, Geheimer Ober-Baurath and Professor of Civil Engineering, died in Berlin Nov. 19, 1892. He was the eldest son of the late Ober-Lander-Baudirector Gotthilf Hagen, author of the well known work on hydraulics. Mr. Ludwig Hagen was Chief Engineer of the Saar and Ihle canals, and succeeded his father as Superintendent of Harbor Work on the Baltic Sea, including the jetties at Tillau harbor, the successful working of which furnished proper argument for Capt. Eads in promoting his proposed work on the Mississippi jetties. Mr. Hagen was also an expert in coast lighting, having carefully and personally studied the systems used in England, France and the United States. For several years he was in charge of the improvement of the Vistula River and the prevention of the disastrous freshets resulting from one of the greatest spring ice jams known on the rivers of the world. He did not live, however, to see these plans carried out.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Several changes are announced. H. C. Ives having resigned to accept other services with the same company, C. F. Resseguie has been appointed Superintendent of lines east of the Missouri River. G. J. Hartman is appointed Superintendent of the Southern Division, vice C. F. Resseguie, transferred. H. U. Mudge is appointed Superintendent of the Western Division, vice G. J. Hartman, transferred. T. H. Sears is promoted to Superintendent of the Rio Grande Division, vice H. U. Mudge, transferred.

Camden & Atlantic.—Samuel Rea, assistant to President Roberts, who is now performing a part of the duties of the late Joseph N. DuBarry, second Vice-President of the Pennsylvania, was last week elected a director of the Camden & Atlantic and West Jersey roads to fill the vacancy caused by the death of Mr. DuBarry.

Central of Georgia.—At the annual election of directors held Jan. 2 the following were elected: H. M. Comer, A. Netzburg, Joseph Hull, G. J. Mills, H. R. Jodson, of Savannah; C. H. Phinizy, of Augusta; S. R. Jacques, of Macon; E. P. Howell, of Atlanta; W. B. Harold, of Americus; James Swain, of New York; and J. B. Holst, W. S. Tison and L. T. Turner, of Savannah. The last three are new members.

Central Pacific.—G. L. Lansing, Secretary of the Southern Pacific, has been elected Secretary of the Central Pacific Railroad, in place of E. R. Miller, deceased.

Chicago Great Western.—D. W. Cooke has been officially appointed Assistant General Passenger and Ticket Agent of the road, the appointment to date from Jan. 1.

Chicago, Rock Island & Pacific.—C. Dunlap, General Superintendent, has announced several appointments to take effect from Jan. 1. A. J. Hitt, Superintendent of the Eastern Division, with headquarters at Horton, is appointed Assistant General Superintendent of all lines west of the Missouri River, with headquarters in Topeka, vice W. S. Page, resigned. W. J. Lawrence is appointed Superintendent of the Horton Division, vice A. J. Hitt, promoted. W. M. Hobbs is made Superintendent of the Herrington Division, vice S. B. Hovey, promoted. R. B. Agnew is made Assistant Superintendent of a portion of the eastern division between Horton and Nelson, with headquarters at Fairbury, Neb. F. M. Conlon has been appointed Assistant Superintendent of the Illinois Division, with headquarters at Chicago, vice W. M. Hobbs, resigned.

F. M. Conlan has been appointed Assistant Superintendent of the Illinois Division, headquarters at Chicago, Ill., vice W. M. Hobbs, promoted.

Chicago, St. Paul, Minneapolis & Omaha—The Northern and Eastern divisions will be operated separately hereafter. The Eastern division will extend from Minneapolis to Elroy, including all branches in that section, and will be under the direction of Superintendent McCabe. The Northern division will include lines north of North Wisconsin Junction, and will be under the supervision of A. W. Trenholm, who will have headquarters at Spooner, Wis.

Cincinnati & Bedford.—A meeting of the directors was held last week at the office of President Tracy of the Ohio & Mississippi. Judge Harmon was elected President, and General Shattuc, C. A. Beecher, A. Hayward, F. W. Tracy were added to the directory. The road is operated by the Ohio & Mississippi.

Illinois Central.—A number of changes in the management of the Illinois Central went into effect Jan. 1. The jurisdiction of A. W. Sullivan, General Superintendent, has been extended over the entire system, including the Yazoo & Mississippi Valley road. The jurisdiction of J. F. Wallace, Chief Engineer, has been similarly extended, and the office of Superintendent of Roadway of the Yazoo & Mississippi Valley has been abolished. The offices of Superintendent of Northern, Southern and Western lines are also abolished. J. G. Hartigan, formerly Superintendent of Northern lines, has been appointed Assistant General Superintendent, with jurisdiction over all divisions north of the Ohio River and including lines west of the Mississippi. The title of M. Gilleas, formerly General Superintendent of the Yazoo & Mississippi Valley, has been changed to that of Assistant General Superintendent. O. M. Dunn, formerly Superintendent Southern lines, has been appointed Superintendent of the Louisiana Division, with jurisdiction over New Orleans terminals, with office at New Orleans. J. W. Higgins, formerly Division Superintendent of the Louisiana Division, has been appointed Superintendent of the New Orleans terminals.

A. Philbrick has been appointed Roadmaster of the Louisiana Division, vice Captain J. T. Ansley, resigned, the appointment to take effect from Jan. 1.

Interoceanic (Mexico.)—J. B. Phipps has been appointed Assistant General Freight and Passenger Agent of this company, with office in the City of Mexico. Mr. Phipps was formerly Commercial Agent.

Kansas City, St. Joseph & Council Bluffs.—Several official changes are announced on the Missouri lines of the Burlington as the result of establishing headquarters in St. Louis for the Missouri lines of the system. H. C. Orr, Assistant General Passenger Agent, is transferred to Kansas City, and Mr. D. A. Ives, the newly appointed General Passenger Agent, makes his headquarters in St. Louis. W. Gray is appointed Assistant General Freight Agent in St. Louis and H. R. Todd General Agent.

Kansas City, Wyandotte & Northwestern.—Newman Erb, Receiver of the road, announces the appointment of George C. Smith as General Manager. The control of this line was recently secured by the Missouri Pacific, of which Mr. Smith is Assistant General Manager.

Lehigh Valley.—R. H. Wilbur has been appointed General Eastern Superintendent. The jurisdiction of James Donnelly, Superintendent of the New Jersey division, has been extended over the Lehigh division, with office at Perth Amboy, N. J.

Lookout Mountain (Chattanooga).—The company has been reorganized with T. B. Redmond as President, Linn White as Vice-President and Clem S. Henry as Secretary. Work upon the road will recommence shortly.

Louisville, Evansville & St. Louis Consolidated.—The following appointments have been announced on the Mackey lines, to take effect from Jan. 1: E. O. Hopkins, Vice-President and General Manager, Evansville, Ind.; R. A. Campbell, General Freight and Passenger Agent, St. Louis; A. G. Palmer, Assistant General Freight and Passenger Agent, St. Louis; S. J. Cassetty, General Agent, Evansville, Ind.; J. B. Campbell, General Agent, Louisville, Ky., and J. R. Sample, Superintendent, Huntingburg, Ind. J. R. Sample, who has been Superintendent of the terminals at Evansville, took the place of James Montgomery, who resigned some two months ago, but whose resignation was not accepted until the present time.

Michigan Central.—Clerk Haire has been appointed Assistant Superintendent of the Saginaw & Mackinaw division of the road.

New Orleans & Northwestern.—W. D. Jenkins has resigned as General Manager, and L. K. Hyde, President and Receiver, assumed control and active management of the above road Jan. 1.

Norfolk & Western.—F. C. Bryan, Assistant General Passenger Agent of the Seaboard Air Line, has been appointed General Western Agent of the Norfolk & Western Dispatch, with headquarters at No. 221 LaSalle street, Chicago.

Ohio & Mississippi.—The Board of Directors has received the resignations of J. F. Barnard, George C. Magoun, William Libbey and George F. Crane. Their places have been filled by the election of John H. Davis, of John H. Davis & Co., New York; W. D. Searls, Vice-President of the Farmers' Loan & Trust Co.; William Mertens, of L. Von Hoffmann & Co., of New York, and J. P. Heseltine, of Heseltine, Powell & Co., of London. The new Directors represent the Baltimore & Ohio interest.

Oklahoma Midland.—The officers and directors of the road are as follows: Board of Directors, A. J. Vanlandingham, of Kansas City; H. M. Fickenger, of Little Rock, Ark.; W. H. Ebey, C. R. Jones and Judge Ladner Guthrie, of Oklahoma City. The officers are: A. J. Vanlandingham, President; H. M. Fickenger, Vice-President and General Manager; W. H. Ebey, Secretary; C. R. Jones, Treasurer; L. Guthrie, Solicitor.

Pennsylvania.—Two new divisions have been created. The Cambria & Clearfield division will be in charge of Superintendent D. H. Lovell, now on the Bedford division, whose office will be at Cresson, Pa. The second division, to be known as the Delaware Extension and Kensington division, will include nearly all the roads in Philadelphia except the main tracks of the New York and Philadelphia divisions, and will be in charge of Frank Ellmaker, now Superintendent of the Camden & Amboy division. As a consequence of these changes Wilson Brown, Superintendent of the Belvidere division, becomes Superintendent of the Amboy division, and is succeeded by A. P. Gest on the Belvidere division. A. W. Moss, of the Lewiston division, succeeds Mr. Gest as Superintendent of the Frederick division.

W. B. McCaleb, formerly Assistant Engineer of the West Penn Division, succeeds to the vacancy caused by the transfer of Frank F. Robb, Assistant Engineer of the Middle Division, to the Superintendency of the Bedford Division. J. W. Nelson, of Middletown, becomes Assistant Engineer on the West Pennsylvania Division.

Peoria, Decatur & Evansville.—R. B. Starbuck, who has been appointed Superintendent of this road and of the Chicago & Ohio River Road, with headquarters at Mattoon, Ill. F. A. Willard has been appointed General Agent at Peoria, Ill., to succeed A. G. Palmer, appointed Assistant General Freight Agent of the Louisville, Evansville & St. Louis.

Philadelphia & Reading.—E. W. Drinker has been appointed Division Freight Agent of the company, with headquarters at the Mekes Baue station of the Lehigh Valley.

Pullman's Palace Car Co.—The following changes are announced: J. C. Morrison appointed District Superintendent, with office at Union Depot, St. Louis, vice F. H. Crane, resigned. F. C. Wickes, promoted to First Assistant District Superintendent, St. Louis. O. S. Newell, formerly agent at San Antonio, Tex., has been made District Superintendent at San Antonio.

Rome, Watertown & Ogdensburg.—The annual meeting of the stockholders last week resulted in the re-election of Charles Parsons, Clarence S. Day, Charles Parsons, Jr., Edwin Parsons, William Lummis, Chauncey M. Depew, H. Walter Webb, William M. White, John Thorn, J. F. Maynard, Walton Ferguson, George Parsons and John M. Crouse. The Directors organized by electing Charles Parsons, President; Clarence S. Day and Charles Parsons, Jr., Vice-Presidents, and J. A. Lawyer, Secretary and Treasurer.

Salt Creek & Deep Creek.—Following are the names of the directors of this company, just incorporated in Utah: T. P. Murray, Nicholas Treweek, M. H. Walker, C. T. Stephenson, W. G. Van Horne, W. S. McCormick and F. M. Lyman. The officers are: Col. T. P. Murray, Salt Lake City, President; N. Treweek, Vice-President; M. H. Walker, Treasurer, and C. E. Stephenson, Secretary. M. H. Walker has subscribed for over 22,000 shares of the capital stock. J. T. Brecken is Chief Engineer.

San Antonio & Aransas Pass.—James W. Terry, late of the Louisville & Nashville at Louisville, has been appointed Assistant Auditor of the road, a newly created position.

Terre Haute & Indianapolis.—The stockholders of the company met at Terre Haute, Ind., and elected the following Directors: W. R. McKeen, D. W. Minshall, Josephus Collett, J. C. Williams, Herman Hulman, Sr., and George E. Farrington. The Directors elected the following officers: J. G. Williams, Vice-President and General Manager; J. W. Cruft, Treasurer; George E. Farrington, Secretary.

Texas Midland.—The first board of the company is composed of T. W. House and W. J. Quinlan, Jr., of Houston, Tex., and E. H. R. Green, M. B. Loyd, E. H. Green, J. S. Lockwood and G. G. Williams. The directors will meet at Terrell, Tex., at an early date and elect officers.

Toledo, St. Paul & Kansas City.—The passenger department has appointed a successor to Thomas S. Timpson, who some weeks ago resigned as Eastern Passenger Agent to take a like position with the Lake Shore. The new appointee is A. W. Ecclestone, formerly Chief Clerk to General Passenger Agent Lambert of the West Shore, and a brother-in-law of S. R. Callaway, President of the company. The headquarters will be removed from Buffalo to New York City.

West Shore.—James W. Musson, having resigned the position of General Traffic Manager of this road, to accept an important position elsewhere, Percy R. Todd has been appointed to fill the vacancy. Francis La Bau has been appointed General Freight Agent, and the position of Assistant General Freight Agent has been abolished.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Alabama Roads.—A bill incorporating the Cherokee Mineral Railroad Co. has passed the Alabama State Legislature.

Baltimore & Lehigh.—The company has completed arrangements to change the road to the standard gauge. Work will probably be commenced next month and will be finished in July by the time the Baltimore Belt Line road, with which it has a traffic contract, is completed.

Butte, Anaconda & Pacific.—The grading is reported to be nearly all completed between Butte, Mont., and the smelters at Anaconda, but it is not intended to lay any track before April.

Chicago & Calumet Valley.—The company filed articles of incorporation with the Secretary of State at Springfield, Ill., last week. The proposed road is to extend from the southern part of Chicago Township, Cook County, to Lyons and other points in Cook County. The capital stock is $500,000, and the incorporators are John G. Campbell, John Payne, Henry S. Ritter, William Brace and Cornelius V. Smith, all of Chicago.

Cloverdale Iron & Land Co.—The company has graded a branch road (narrow gauge) from the main line of the Shenandoah Valley to its mines near Cloverdale, Va.

Coal River.—This company was chartered in West Virginia early in 1892 to build a road from St. Albans, at the mouth of Coal River, to Peytonia, Boone County, with a branch up Little Coal River to Boone C. H. The incorporators are all extensive landowners in what is known as the Coal River Basin, which contains 1,000 square miles of bituminous and cannel coal and hardwood timber, nearly all of which would be tributary to the road proposed. To secure the construction of the road it was proposed that each landowner give a proportionate number of acres to the construction company that would undertake the work. On last Friday a conference of those interested, among whom are Governor A. B. Fleming and Governor-elect MacCorkle, of West Virginia; J. C. Anderson and J. L. Brown, of Charleston, W. Va.; Dr. W. R. Pryor, son of Judge Pryor, of New York; Dr. W. D. Byrne and his son, John D. Byrne, of New York; A. St. Clair, of Gorham, Va., and John McClintic, of Lexington, Ky., was held in Charleston, W. Va. At this conference Gen. J. S. Casement, of Painesville, O., who is now building the branch of the Kanawha & Michigan from Malden, W. Va., to Gauley Bridge, and a junction with the Chesapeake & Ohio, made a proposition that a company which he represented would, in consideration of 500 acres of land a mile, or 25,000 acres for the whole, build the line over the route described above, making the proviso that he be allowed till July 1, 1893, in which to examine the contiguous coal and timber lands. He also agrees to complete at least 20 miles of the road within one year. This proposition was conditionally accepted. Owners of 15,000 acres of the 25,000 acres of land are concerned in this agreement, and a committee was appointed to assess other landowners in proportion to their holdings. The surveyed route is approximately 50 miles in length and opens a territory, now without transportation facilities. The line reaches the coal deposits 10 miles from the mouth of Coal River, of which there are four seams ranging from 4 to 13 ft. in thickness. Preliminary surveys have also been made for extending the road to a connection with a proposed branch of the Norfolk & Western up Guyandotte River and to a connection with the Chesapeake & Ohio branch up Loup Creek.

Denver & Rio Grande.—The contractors have about 500 men at work on the contract for grading on the Crested Butte branch in Colorado. Grading has been in progress for the last two weeks at various points along the line between Crested Butte and the Irwin coal mines. The contractors are Levy & Moore.

Dunnellon Phosphate Co.—The company, it is reported, will build a road 15 miles long to connect with the Ambler Phosphate Co.'s road at Early Bird, Fla.

Everett & Monte Cristo.—Supt. A. A. Allen reports that the recent flood in western Washington has delayed construction work from 60 to 90 days, much of the grading having been washed away. Work will be prosecuted all winter below the snow line, but beyond that point it will have to be suspended until spring. The road may not be completed before May. The line between Everett, Wash., and Snohomish will be operated soon. Henry & Balch, the contractors, have the track laid above Granite Falls, at the crossing of the Stillagaumish River, where a 300-ft. bridge will be built.

Granite City & Belt Line.—This company has filed articles of incorporation in Illinois to build a road from the Chicago, Peoria & St. Louis, and the Toledo, St. Louis & Kansas City roads, in Madison County, to connect with the Wabash and the Chicago & Alton. The principal office is to be at Granite City. The capital stock is $100,000, and the incorporators are F. G. Niedringhaus, W. F. Niedringhaus, Frederick Niedringhaus, Thomas K. Niedringhaus and George W. Niedringhaus, all of St. Louis.

Great Northern.—Reports from the tracklaying forces are that the through connection will not be made before Jan. 10. Grading is now completed along the whole line, and the tracklayers are making more or less progress each day. The severe weather greatly delays work. It will be late in April before the road is in shape for through passenger traffic. The contract for building the 14,000-ft. tunnel through the Cascade Mountains has not been let yet.

La Porte, Houston & Northern.—The contract was signed last week with J. F. Allen for the Clear Creek extension of the road, from La Porte to Clear Creek, Tex., where connection will be made with the North Galveston, Houston & Kansas City road.

Leavenworth.—A charter was filed by the company last week to build a road from Ft. Leavenworth, Kan., through the city of Leavenworth and the Soldiers' Home to Lansing. The estimated length of the line is 40 miles. The directors are: Harry L. Earle, Leavenworth; A. B. Nettleton, Minneapolis, Minn.; F. W. Huidekoper, New York; Robert J. Brown and W. H. Stacey, Leavenworth.

Louisiana, Arkansas & Missouri.—The contract will soon be let for building the line from the present terminus, south of Trippe Junction, Ark., to Bryan City, La., a distance of about 116 miles. This portion of the line will probably be completed in 1893. The road is now built from Trippe Junction, west of Arkansas City, south for six and one-half miles. It has been surveyed and located from Brinkley, Ark., south to Alexandria, La., a distance of 240 miles. With the exception of 20 miles of heavy levee embankment, the work is comparatively light. The company owns over 800,000 acres of timber lands in the Tensas district of Louisiana. Harlow M. Hoyt, 16 and 18 Exchange place, New York, is President; H. A. Fisher, Vice-President and General Manager, St. Louis; and W. Barclay Parson, New York, is Chief Engineer.

Lufkin, South & Southeastern.—W. H. Bonner, J. H. Kurth, S. W. Henderson, A. M. Denman and others have incorporated this company in Texas to build a road from Lufkin to Rockland, Tyler County. The capital stock is $250,000.

Montcalm.—The incorporators of this Quebec company propose to build a road from the town of Des Laurentides to a point on the Canadian Pacific, near the town of Joliette, Que. Euclide Dugas, Odilon Goulet, of St. Jacques de l'Achigan; Arsene Charland, of St. Alexis; Horace Ethier, of Des Laurentides; Francois O. Dugas, of Joliette, and others are the incorporators.

Nashville & Knoxville.—The contractors have about 300 men working on the extension from Allgood east to Standing Stone, Tenn., 18 miles, and the track will be laid in March. The grading is practically completed except on about one and a half miles of rock work.

New Roads.—Work on the new Graham branch leading from Graham Station, Pa., to the Goss coalfields is rapidly nearing completion. The grading and bridging has been completed, and the track will soon be laid. The branch is nearly two miles in length, and reaches the Goss coal land, leased by J. W. Cook & Son, of Bellefonte, Pa.

S. Carr will apply for a charter incorporating a company to construct a road from Durham to Charlotte, N. C., by the way of Durham, Chatham, Moore, Montgomery, Stanly and Mecklenburg counties.

North Galveston, Houston & Kansas City.—The road is about graded the entire length from Virginia Point to North Galveston, Tex., 19 miles. The idea of putting in falsework over Dickinson Bayou has been abandoned, and a permanent drawbridge will be built at once instead of a temporary one. When it is finished the four miles to North Galveston will be laid with rails. The line from this point to Clear Creek, where it connects with the La Porte, Houston & Northern, has been located and the grading of the eight miles will begin at an early day. J. P. Nelson is the contractor.

Ohio Southern.—McArthur Bros., who have the contract for the first 30 miles of the extension from Springfield to Lima, O., have sublet the work to the following firms, the numbers referring to the sections: Section 1, J. W. Callahan; 2, John Patterson & Son; 3, 4 and 5, W. M. McIntyre; 7, Matt Spellace, and 9 to 18, Pat Gibbons, all of Springfield, O. Sec. 19, T. M. Campbell; 20 and 21, O. Boylon; 22, 23 and 24, Thomas McGreggor; 25, 26, 27 and 28 (heavy work), McDougal & Beaconer, and 29 and 30, H. E. Clark, all of St. Paris, O.

Ottawa & Parry Sound.—A bylaw granting a bonus of $125,000 to this road was carried at an election at Ottawa, Jan. 2. The road is projected as an extension of the Canada Atlantic west of Ottawa. C. J. Booth, of Ottawa, is President.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The new branch between McDonald, Pa., and Bridgeville has been completed and is now open for operation. The line is almost seven miles in length and opens up some coal property. Two trains each way have been placed on the branch.

Providence & Springfield.—The grading is about half completed over the extension from Pascoag, R. I., northeast to a connection with the New York & New England in Douglas, Mass. Ward Brothers, now of Pascoag, are the contractors, and they expect to have the road ready for traffic in June.

South Carolina Roads.—Application will be made to the Legislature of South Carolina for a charter for a road to extend from North Augusta, S. C., to Graniteville, Langley and Aiken; also to incorporate the Beaufort & Port Royal Street & Suburban, and to incorporate the Berkeley Railroad Co.

State Line.—On Jan. 8 the extension of this branch of the Baltimore & Ohio from Uniontown south to Smithfield, Pa., a distance of ten miles, will be opened for passenger traffic.

Staten Island Rapid Transit.—The company has begun work on the extension of its track from Arrochar, N. Y., to the southwest. The Arrochar station will be moved from its present site to a point nearer the Fort Wadsworth station. From there the road will run through Arrochar Park and then along back of South Beach for about a mile. The extension will be in operation early in May.

Tehuantepec.—Three thousand men are now employed on the construction, which is progressing rapidly on both the north and south divisions. Track has been laid on the north end to the seventieth mile, and on the south division to mile post 63, leaving about 59 miles yet to build. For over one-half this latter distance the road is already graded.

Williamsport & North Branch.—The work on the extension from Nordmont north to Dohm's Summit, Pa., is in a very forward state, and about 1,000 men are at work. E. J. Gaynor & Co., of La Porte, Pa., are the contractors, and the contract provides for the completion of the branch by May 1. The work is heavy and is being done in the most substantial manner. Stone culverts are used as far as possible. Two large arch culverts are used and two iron truss bridges of 150 ft. span are to be built by the Pencoyd Iron Works which are to be completed in March. The distance is 18½ miles and the line forms the connecting link between the two branches of the Philadelphia & Reading system in the North Branch and the West Branch valleys of the Susquehanna River. B. G. Welch, Hughesville, Pa., is General Manager.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The comparative statement of operations for the month of November and five months of the fiscal year were as follows:

Month of November.	1892.	1891.	Inc.
Operated mileage.....	7,130	7,124	6
Gross earnings.....	$3,566 137	$3,307,682	$258,455
Oper. expenses	2,293,033	2,193,120	99,913
Net earnings	$1,273,104	$1,114,562	$158,542
Other receipts.....	75,000	75,000	.....
Total net earnings,	$1,348,104	$1,189,562	$158,542
P. c. of fixed charges..	850,000	850,000	.....
Surplus	$498,104	$339,562	$158,542
Five months, to Nov. 30.			
Operate mileage.....	7,130	7,121	9
Gross earnings.....	$17,473,903	$16,399,313	$1,074,590
Oper. expenses	11,377,810	10,800,639	577,181
Net earnings.....	$6,096,083	$5,598,674	$497,409
Other receipts.....	375,000	375,000	.....
Total net earnings.	$6,471,083	$5,973,674	$497,409
Five-twelfths annual fixed ch'gs (Est.).....	4,250,000	4,250,000	.....
Surplus.....	$2,221,083	$1,723,674	$497,409

The figures for the aggregated general system, including the St. Louis & San Francisco and the Colorado Midland, are as follows:

Month of November:	1892.	1891.	Inc.
Operated mileage....	9,345	9,338	7
Gross earnings.....	$4,554 931	$4,306,918	$248,043
Operating expenses..	2,991,202	2,796,988	197,214
Net earnings.....	1,560,759	1,509,930	50,829
Other receipts.....	75,000	75,000	.....
Total net earnings. ..	1,635,759	1,584,930	50,829
One-twelfth fixed charges (Est.).....	1,191,000	1,192,000	2,000
Surplus.....	441,759	392,930	48,829
Five Months, to Nov. 30:			
Operated mileage....	9,345	9,335	10
Gross earnings	$22,750,829	$21,330,317	$1,420,512
Operating expenses...	14,699,153	13,817,857	881,296
Net earnings.....	8,051,676	7,512,460	539,21
Other receipts.....	375,000	375,000	.....
Total net earnings....	8,426,676	7,887,460	539,2 16
Five twelfths fixed charges (Est.).....	5,976,000	5,960,000	10,000
Surplus.....	2,456,676	1.927,460	529,216

Belleville & St. Louis.—The company has filed resolutions with the Secretary of State in Springfield, Ill., increasing the capital stock to $500,000 and authorizing the issue of bonds in the sum of $500,000, maturing in 20 years and bearing 5 per cent. interest.

Charleston, Cincinnati & Chicago.—The reorganization Committee of the company which some time since purchased the Tennessee portion of the road, has applied for a decree for the sale of that part of the line outside of Tennessee.

Chesapeake & Ohio.—The statement of earnings for November shows:

	1892.	1891.	Inc. or dec.
Gross earn	$830,162	$863,754	D. $33,592
O. ex. and taxes	559,120	652,175	D. 93,055
Net earn	$271,042	$211,579	I. $59,463
July 1 to Nov. 30:			
Gross earn	$4,550,875	$4,491,588	I. $59,287
Op. ex. per	3,014,410	3,266,017	D. 251,607
Net earn	$1,536,465	$1,225,571	I. $310,894

Chicago, Burlington & Quincy.—The report of earnings for November and for the fiscal year to Nov. 30 is as follows:

Month of November.	1892.	1891.	Inc. or Dec.
Gross earnings	$3,522,902	$3,541,110	D. $18,208
Operating expenses	2,151,581	2,207,999	D. 56,418
Net	$1,371,321	$1,333,111	I. $38,210
Fixed charges	810,000	795,186	I. 14,814
Balance	$561,321	$537,925	I. 23,396
Since Jan. 1.			
Freight	$25,046,914	$20,578 570	I. $4,468,544
Passenger	8,166,684	7,812,504	I. 354,180
Mail, etc	3,654,527	3,437,023	I. 217.504
Gross earnings	$36,868,126	$31,827,897	I. $5,040 229
Operating expenses	23,943,285	19,726,326	I. 4,216,959
Net earnings	$12,924,841	$12,101,571	I. $823,270
Fixed charges	8,910,000	8,747,048	I. 162,952
Balance	$4,014,841	$3,354,523	I. $660,318

Cleveland, Cincinnati, Chicago & St. Louis.—The following statement shows the earnings, operating expenses and fixed charges for six months from July 1 to Dec. 31, 1892:

	1892.	1891.	Inc. or dec.
Gross earn	$8,033,911	$7,312,212	I. $721,699
Oper. expen	5,877,200	5,064,085	I. 813,115
Net earn	$2,156,711	$2,248,127	D. $91,416
Fixed charges	1,325,473	1,290,342	I. 35,131
Balance	$831,238	$957,785	D. $126,547
Pfd. stock dividends	250,000	250,000	
Balance	$581,258	$707,785	D. $126,547
1½% div. on com. stock	420,000	420,000	
Surplus	$161,238	$287,785	D. $126,547

Decatur, Chesapeake & New Orleans.—The road was sold last week under decree of the United States court at Nashville, Tenn. Judge Granville Hawes, of New York, on behalf of the Reorganization Committee, bid the road in for $100,000. It is understood that work will be begun immediately after the confirmation sale to put the road in running order from Shelbyville, Tenn., south to the Alabama State line and toward Decatur, Ala. The road is now completed through Lincoln County, Tenn.

Lehigh Valley.—The earnings reported by the Philadelphia & Reading, lessee of the Lehigh Valley road, for the month of October are as follows:

	1892.	1891.	Inc. or Dec.
Gross earnings	$1,828,626	$1 801,727	I. $26,899
Oper. expenses	1,171,211	1,200,899	D. 29,688
Net earnings	$657,415	$600,828	I. $56 587
Eleven months ending Oct. 31.			
Gross earnings	$16,735,274	$15,590,116	I. $1,145,158
Oper. expenses	12,330,375	12,114,020	I. 216,355
Net earnings	$4,404,899	$3,476,096	I. $928,803

Louisville & Nashville.—The statement for November is as follows:

	1892	1891.	Inc. or dec.
Gross earn	$1,956,609	$1,821,043	I. $135.566
Oper. expen	1,183,705	1,191,358	D. 7,653
Net earn	$772,9 4	$629,685	I. $143,219
Five months from July 1 to Nov. 30:			
Gross earn	$9,654,032	$9,270,022	I. $384,010
Oper. expen	6,043,294	5,863,451	I 179,843
Net earn	$3,610,738	$3,406,571	I. $204,167

New York Central & Hudson River.—The company reports earnings for the quarter ending Dec. 31 as follows:

	1892.	1891.	Inc.
Gross earn	$12,353,386	$12,265,630	$87,756
Oper. expen	8,368,784	8,347,945	20,839
Net earn	$3,984,602	$3,917,685	$66,917
Fixed charges	2,507,779	2,465,446	42,333
Profits	$1,476,822	$1,452,238	$24,584
Dividends	1,117,853	1,117,853	
Surplus	$368,969	$334,385	$24,584
Six months ending Dec. 31:			Inc. or Dec.
Gross earn	$24,419,982	$24,153,617	I. $266 365
Oper. expen	16,767,305	16,004,948	I. 762,358
Net earn	$7,652,676	$8,148,669	D. $495,993
Fixed charges	5,015,299	4,932,375	I. 83,623
Profits	$2,636,677	$3,216,298	D. $579,616
Dividends	2,235,707	2,235,707	
Surplus	$400,970	$980,586	D. $579,616

For the half year ending Dec. 31 the operating expenses were 68.68 per cent. of gross earnings, against 66.26 per cent. the corresponding period of last year, and profits on the stock, 2.95 per cent., against 3.59 per cent.

Northeastern Elevated (Philadelphia).—C. Stuart Patterson, the Master to whom was referred the bill in equity of property owners on Front street, along which the elevated road would pass, against that corporation, to restrain the construction of the road, has decided in favor of the company. He finds that the elevated road has the clear right to construct its line upon elevated tracks. He is of the opinion that the plaintiffs will be entitled to receive compensation for damages. The same question was decided adversely to the company in the petition of Market street property owners against the Quaker City elevated road, and the suit will be appealed.

Ohio & Mississippi.—The contest made by the old directors of the company against the control of that company passing to the Baltimore & Ohio has been brought to a close by the voluntary resignation of four of the five remaining members of the old board. These vacancies have been filled by directors favorable to the Baltimore & Ohio. Before the retirement of these directors, the Baltimore & Ohio had eight of the thirteen directors favorable to the lease to that road.

Tamaroa & Mount Vernon.—The Wabash, Chester & Western has acquired by purchase the line of this company extending from Tamaroa, in Perry County, to Mount Vernon, Jefferson County, Ill., 22 miles, which was built this year, in the interest of the Wabash, Chester & Western.

Wabash.—The financial statement for November and for five months is as follows:

	1892.	1891.	Inc. or dec.
Gross earn	$1,185,775	$1,203,979	D. $18,204
Operating expen	913,008	922,53)	D. 9,522
Net earn	$272,767	$281,449	D. $8,682
July 1 to Nov. 30:			
Gross earn	$6,534,426	$6,559,073	D. $24,647
Oper., expen	4,744,516	4,736,503	I. 8,012
Net earn	$1,789,910	$1,822,569	D. $32,659

Waco & Northwestern.—This road, extending from Bremond to Ross, Tex., a distance of 54 miles, was sold at Waco, Tex., Dec. 28, under a decree of the United States Circuit Court, to satisfy the claim of the Farmers' Loan & Trust Company, trustee, to E. R. Green, representing his mother, Mrs. Green, for $1,375,000. The Southern Pacific was a bidder. The sale was to satisfy $1,096,000 in first mortgage bonds with interest, which are owned by Mrs. Hetty Green, of Chicago.

TRAFFIC.

Traffic Notes.

Messrs. Lewis & Crane, of Seattle, will send a cargo of shingles by vessel around Cape Horn to Philadelphia. If the shipment proves successful other cargoes will follow.

The Atlantic Coast Line on Jan. 1 began running its through trains over the new line between Wilson, N. C., and Florence, S. C., by which the trips of through trains are shortened 61 miles. A new fast train has been put on, leaving Washington for the south at 4 p. m.

Complaints have been filed with the Interstate Commerce Commission charging the Southern Pacific with unjust discrimination in favor of the Standard Oil Co. in past years. The acts alleged began as far back as 1888. This and other roads are also charged with manipulating car-service rates on tank cars in favor of the Standard Oil Co.

A San Francisco despatch states that the trans constinental roads will make heavy reductions in the rates on certain classes of east bound freight which the clipper ships have been carrying around Cape Horn. It is stated that the rate on canned goods will be dropped from $1.10 to 50 cents per 100 lbs., San Francisco to New York, and that wool will be reduced one-third. The shippers of canned goods cannot complain that they do not get their money's worth when they pay three mills per ton per mile.

The through freight line between Boston and the Poughkeepsie bridge by way of Northampton and Simsbury seems to have been abolished. The Boston & Maine has issued a notice at Boston directing westbound shipments to be sent by the Boston & Maine to Worcester; the New York & New England from Worcester to Hartford, and thence by the Philadelphia, Reading & New England. By this change the 30-mile section of the New York, New Haven & Hartford, heretofore used by this line, is left out.

The numerous despatches from Washington concerning the probable action of the Government in the way of changing the regulations for the transportation of freight to and from Canada seem to be got up chiefly for political purposes. There is nothing definite about these reports except that the consular regulations permit freight to pass from Canada to this country with too much facility; but it seems to be admitted that any change making the transfer more difficult would do as much harm to American roads shipping through Canada as to Canadian roads shipping through the United States. There is no indication that the Government will take any action.

The Pennsylvania and the Reading have agreed on a through tariff for coal from the anthracite region to Philadelphia, and joint tariffs were put in effect Jan. 1. It will be remembered that these joint tariffs were abrogated about four months ago on account of the Pennsylvania's refusal to join the Reading in an increase of rates. This has resulted in diverting considerable coal from the Pennsylvania to the Reading road. There is a considerable difference of opinion as to the cause of the present change. The Reading people say that the differences between the two companies were compromised, while the Pennsylvania officials claim a decided victory for their side. General Freight Agent Joyce, of the Pennsylvania, says:

"You will doubtless recollect that when the Reading in September demanded an increase of 10 cents a ton in the tolls on anthracite coal to Philadelphia, the Pennsylvania refused to join in the advanced rates proposed, and the Reading withdrew its coal from the Pennsylvania railroad. The arrangement now made between the Reading, Central of New Jersey and the Pennsylvania restores the joint tariffs to the rates in effect prior to September last." Another statement is to the effect that the new rate is five cents higher than that in force prior to September.

Chicago Traffic Matters.

CHICAGO, Jan. 4, 1893.

Several important meetings have been held the past week in this city, St. Louis and Cincinnati, at which conferences were had between Chairman Walker, of the Joint Committee, and Commissioner Blanchard and representatives of the lines in Central Traffic Association territory in regard to the putting in operation the plan proposed at New York for the regulation of eastbound traffic. As a result of these conferences it is likely that the carrying into effect of the resolutions adopted by the presidents will be at once undertaken and pushed forward as rapidly as possible. Some of the newspaper correspondents have jumped to the conclusion that, because results were not at once apparent, the proposed plan was a failure, being unwilling to wait until the details could be worked out and put into practical operation—a task of no small magnitude.

The indications now are that the managers of the Western lines who have in charge the various plans for association reorganization will let matters rest until some definite action is taken by Congress in regard to pending amendments of the interstate commerce law.

At the meeting of the Central Traffic Association on Dec. 14 the question of differentials via the Mackinaw and Kewaunee routes was taken up and discussed. The Kewaunee route is made up of the Toledo, Ann Arbor & North Michigan and the Green Bay, Winona & St. Paul, and the cars are ferried across the lake at Frankfort. Notwithstanding the fact that the freight goes through without transfer, this line has been quoting a differential, on the basis of lake and rail rates, and the Mackinaw route lines (the Michigan Central and Grand Rapids & Indiana) put in effect a corresponding differential. The Chicago lines were of course forced to meet this competition. The discussion resulted in the adoption of a resolution that in the judgment of the Western members of the Joint Committee no differentials should be allowed via any route that floats cars across the lake, and the officers of the Joint Committee were requested to take immediate steps to cancel the rates. A decision has now been promulgated by the officers of the committee stating that they do not find that any differential was ever authorized on joint committee traffic via either route, and that in their judgment the lines which float their cars across Lake Michigan are not entitled to the lake and rail differentials. All lines having tariffs in force upon any other basis, including lines via Chicago which have met the rates in question, are called upon to restore the same to the standard all-rail basis by Jan. 11. Further provision is made that in case it shall be shown that compliance with the order results in undue depletion of their traffic, the parties affected are entitled to the consideration of the question of proper differentials.

It is announced that the Kanawha Despatch will on Jan. 10 restore the basing rate of the Mississippi River to 72 cents from the reduced rate of 45 cents which has been in effect for some time. This will remove a fruitful source of demoralization in Southern territory, and it is hoped that it will be followed by further restorations.

Notice has been issued making effective the resolution of the Joint Committee adopted at their recent meeting in New York in respect to mileage on refrigerator and other cars. The order is as follows: "Commencing Jan. 2, 1893, the lines east of the western termini of the Trunk Lines will pay only ¾ of 1 cent per mile run on all cars; lines west of the western termini of the Trunk Lines are authorized to pay 1 cent per actual mile run, loaded or empty, on cars carrying fresh dressed meats only, and on all other cars will pay only ¾ of 1 cent per mile until otherwise agreed."

Chairman Walker and Commissioner Blanchard give notice that they fail to find any eastbound contracts to exist which, in their opinion, cannot be legally abrogated, and order the immediate cancellation of all outstanding contracts on eastbound freight of all classes, including export, whether made in the West or the East. Permission is given any company or line which finds itself involved in obligations which it has reason to believe cannot be legally terminated, to file a statement to that effect, together with the opinion of counsel, for further consideration.

Last week's total east bound shipments, except live stock, were 66,570 tons, against 68,861 the previous week and 134,676 the corresponding week last year. Of last week's shipments, 39,282 tons were through business, against 95,974 the corresponding week last year. The falling off was almost entirely in grain. Of the through traffic, Michigan Central took 27 per cent.; Grand Trunk, 22; Lake Shore, 17; Nickel Plate, 12; Fort Wayne, 11; Pan Handle and Baltimore & Ohio, each 5.

Interstate Commerce Commission.

The Commission, by Commissioner Knapp, has rendered its opinion in the case of the Board of Trade of Chattanooga against the East Tennessee, Virginia & Georgia and others. The complaint alleged that rates from New York to Chattanooga are unreasonable in themselves and as compared with rates on like property to Memphis and Nashville, and that rates on such traffic are greater for the shorter distance to Chattanooga than for the longer distance over the same line in the same direction to Memphis and Nashville. It is held that defendants are justified by the existence of water competition of controlling force in charging less for the longer distance to Memphis, but that no such competition exists to Nashville, and any greater charge to Chattanooga than for the longer distance through Chattanooga to Nashville is in violation of the fourth section of the Act to Regulate Commerce. Defendants are ordered to cease and desist from making such greater charges to Chattanooga, with leave to file application for relief under the proviso clause of the fourth section within a specified time.

Anthracite Coal Trade.

The anthracite coal trade closed the year 1892 in better condition than it has been for years past. It was the banner year for production, the total output approximating forty-one million tons, or more than one million tons greater than that of 1891, which also exceeded all previous records. The average price received for coal in 1892 was more profitable than for the past five years or more. The conditions of the trade, too, have been better regulated, both as regards production and selling price. While several months ago the output for the year 1892 exceeded that of the previous year to the corresponding date by 1,500,000 tons, by the exercise of business-like methods during the past three months, the excessive production was halted and the weekly production curtailed in such manner that the year closed with a total output of only about 1,000,000 tons ahead of 1891. The crowning feature came at the close of the year. It was the harmonizing of the differences between the Pennsylvania and Reading roads by an agreement to re-establish joint rates on anthracite from the mines to Philadelphia and near-by junction points. This will very much benefit the local and Southern trade, which has been greatly inconvenienced since the withdrawal of the joint tariffs. The Reading will issue new tariff sheets, making the rate on Wyoming coal $1.80 from the mines to Philadelphia, and on Schuylkill and Lehigh coal $1.75. This rate is five cents lower than the one made by the Reading in September and five cents higher than the rate ruling before that time. A like adjustment of tariffs to New York tidewater and New England points will be made.

The Lehigh & Wilkes Barre Coal Co. has decided to terminate the agreement made in February last to sell its entire output of coal to the Reading Co., who marketed the same. This contract was made at the time the famous Reading-Lehigh Valley-Jersey Central combine was formed. The movement is said to be in no sense hostile to the Reading, and, as evidence of this, the Lehigh & Wilkes Barre Co. has appointed as its general sales agent in New York Percy Heilner, the New York agent of the Reading. The Lehigh & Wilkes Barre Co. mines about 2,500,000 tons per year, all of which is shipped over the Central of New Jersey to market, and this railroad owns a majority of the Lehigh & Wilkes Barre capital stock.—*Philadelphia Public Ledger.*